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FAIRFIELD

Institute of Management & Technology

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Reference Material for Three Years

Bachelor of Economic (Hons.)

Code : 216

Semester – II

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Principles of Macroeconomics(102) Course: B.A(eco) Sem-2

1) What is Fiscal policy?

Fiscal Policy is the means by which a government adjusts its spending levels and tax rates to monitor and influence a nation's economy. It is the sister strategy to monetary policy through which a central bank influences a nation's money supply. These two policies are used in various combinations to direct a country's economic goals. Here's a look at how fiscal policy works, how it must be monitored, and how its implementation may affect different people in an economy.

2) What are the instruments of fiscal policy?

i. **Taxation Policy:** The structure of tax rates has to be varied in the context of conditions prevailing in an economy. Taxes determine the size of disposable income in the hands of general public and therefore, the quantum of inflationary and deflationary gaps. During depression tax policy has to be such as to encourage private consumption and investment; while during inflation, tax policy must curtail consumption and investment

ii. **Public Debt:** A sound programme of public borrowing and debt repayment is a potent weapon to fight inflation and deflation. Government borrowing can be in the form of borrowing from non-bank financial intermediaries, borrowing from commercial banking system, drawings from the central bank or printing of new money.

iii. **Public Expenditure:** Public expenditure can be used to stimulate production, income and employment. Government expenditure forms a highly significant part of the total expenditure in the economy. A reduction or expansion in it causes significant

variations in the total income. It can be instrumental in adjusting consumption and investment to achieve full employment

3) What are the functions of Money?

i. PRIMARY FUNCTION

a) Medium of exchange: Money, as a medium of exchange, means that it can be used to make payments for all transactions of goods and services. It is the most essential function of money. Money has the quality of general acceptability So, all exchanges take place in terms of money.

b) Measure of Value: Money as measure of value means that money works as a common denomination, in which values of all goods and services are expressed.

ii. SECONDARY FUNCTION

a) Standard of Deferred payment: Money as a standard of deferred payments means that money acts as a 'standard' for payments, which are to be made in future. Every day, millions of transactions take place in which payments are not made immediately. Money encourages such transactions and helps in capital formation and economic development of the economy.

b) Store of value: Money as a store of value means that money can be used to transfer purchasing power from present to future. Money is a way to store wealth. Although wealth can be stored in other forms also, but money is the most economical and convenient way. It provides security

to individuals to meet contingencies, unpredictable emergencies and to pay future debts. Under barter system, it was difficult to use goods as a store of wealth due to perishable nature of some goods and high cost of storage.

4) Describe Balance of payment.

Balance Of Payment (BOP) is a statement which records all the monetary transactions made between residents of a country and the rest of the world during any given period. This statement includes all the transactions made by/to individuals, corporates and the government and helps in monitoring the flow of funds to develop the economy. When all the elements are correctly included in the BOP, it should sum up to zero in a perfect scenario. This means the inflows and outflows of funds should balance out. However, this does not ideally happen in most cases.

5) Describe the elements of balance of payment.

Element of balance of payment

i. Current account: The current account is used to monitor the inflow and outflow of goods and services between countries. This account covers all the receipts and payments made with respect to raw materials and manufactured goods. It also includes receipts from engineering, tourism, transportation, business services, stocks, and royalties from patents and copyrights. When all the goods and services are combined, together they make up to a country's Balance Of Trade (BOT).

ii. Capital Account: All capital transactions between the countries are monitored through the capital account. Capital transactions include

the purchase and sale of assets (non-financial) like land and properties. The capital account also includes the flow of taxes, purchase and sale of fixed assets etc by migrants moving out/in to a different country. The deficit or surplus in the current account is managed through the finance from capital account and vice versa.

iii. Financial Account: The flow of funds from and to foreign countries through various investments in real estates, business ventures, foreign direct investments etc is monitored through the financial account. This account measures the changes in the foreign ownership of domestic assets and domestic ownership of foreign assets. On analyzing these changes, it can be understood if the country is selling or acquiring more assets (like gold, stocks, equity etc).

6) What if inflation? Explain the different types of Inflation.

Inflation is a quantitative measure of the rate at which the average price level of a basket of selected goods and services in an economy increases over some period of time. It is the rise in the general level of prices where a unit of currency effectively buys less than it did in prior periods. Often expressed as a percentage, inflation thus indicates a decrease in the purchasing power of a nation's currency.

Different types of Inflation

i. Currency Inflation: This type of inflation is caused by the printing of currency notes.

ii. Credit Inflation: Being profit-making institutions, commercial banks sanction more loans and advances to the public than what

the economy needs. Such credit expansion leads to a rise in price level.

iii. Deficit-induced inflation: The budget of the government reflects a deficit when expenditure exceeds revenue. To meet this gap, the government may ask the central bank to print additional money. Since pumping of additional money is required to meet the budget deficit, any price rise may the be called the deficit-induced inflation.

iv. Creeping or mild inflation: If the speed of upward thrust in prices is slow but small then we have creeping inflation. What speed of annual price rise is a creeping one has not been stated by the economists. To some, a creeping or mild inflation is one when annual price rise varies between 2 p.c. and 3 p.c. If a rate of price rise is kept at this level, it is considered to be helpful for economic development. Others argue that if annual price rise goes slightly beyond 3 p.c. mark, still then it is considered to be of no danger.

v. Walking Inflation: If the rate of annual price increase lies between 3 p.c. and 4 p.c., then we have a situation of walking inflation. When mild inflation is allowed to fan out, walking inflation appears. These two types of inflation may be described as 'moderate inflation'.

Often, one-digit inflation rate is called 'moderate inflation' which is not only predictable, but also keep people's faith on the monetary system of the country. Peoples' confidence get lost once moderately maintained rate of inflation goes out of control and the economy is then caught with the galloping inflation.

vi. Galloping and hyperinflation: Inflationary situation may be open or suppressed. Because of anti-inflationary policies pursued by the government, inflation may not be an embarrassing one. For

instance, increase in income leads to an increase in consumption spending which pulls the price level up.

If the consumption spending is countered by the government via price control and rationing device, the inflationary situation may be called a suppressed one. Once the government curbs are lifted, the suppressed inflation becomes open inflation. Open inflation may then result in hyperinflation.

7) What is Monetary policy?

Monetary policy is a central bank's actions and communications that manage the money supply. That includes credit, cash, checks, and money market mutual funds. The most important of these forms of money is credit. It includes loans, bonds, and mortgages.

Monetary policy increases liquidity to create economic growth. It reduces liquidity to prevent inflation. Central banks use interest rates, bank reserve requirements, and the number of government bonds that banks must hold. All these tools affect how much banks can lend. The volume of loans affects the money supply.

8) What are the instruments of Monetary policy?

i. **Open Market Operation**: Open Market Operations is when the RBI involves itself directly and buys or sells short-term securities in the open market. This is a direct and effective way to increase or decrease the supply of money in the market. It also has a direct effect on the ongoing rate of interest in the market

ii. **Bank Rate**: One of the most effective instruments of monetary policy is the bank rate. A bank rate is essentially the rate at which the RBI lends money to commercial banks without any security or

collateral. It is also the standard rate at which the RBI will buy or discount bills of exchange and other such commercial instruments

So now if the RBI were to increase the bank rate, the commercial banks would also have to increase their lending rates. And this will help control the supply of money in the market. And the reverse will obviously increase the supply of money in the market.

iii. **Cash Reserve Ratio**: Cash Reserve Ratio (CRR) is the portion of deposits with the commercial banks that it has to deposit to the RBI. So CRR is the percent of deposits the commercial banks have to keep with the RBI. The RBI will adjust the said percentage to control the supply of money available with the bank. And accordingly, the loans given by the bank will either become cheaper or more expensive. The CRR is a great tool to control inflation.

iv. **Statutory Liquidity Ratio**: The Statutory Liquidity Ratio (SLR) is the percent of total deposits that the commercial banks have to keep with themselves in form of cash reserves or gold. So increasing the SLR will mean the banks have fewer funds to give as loans thus controlling the supply of money in the economy. And the opposite is true as well.

v. **Moral Suassion**: This is an informal method of monetary control. The RBI is the Central Bank of the country and thus enjoys a supervisory position in the banking system. If there is a need it can urge the banks to exercise credit control at times to maintain the balance of funds in the market. This method is actually quite effective since banks tend to follow the policies set by the RBI.

9) Explain the measurement method of National Income.

i. Product Method: In this method, the value of all goods and services produced in different industries during the year is added up. This is also known as the value added method to GDP or GDP at factor

cost by industry of origin. The following items are included in India in this: agriculture and allied services; mining; manufacturing, construction, electricity, gas and water supply; transport, communication and trade; banking and insurance, real estates and ownership of dwellings and business services; and public administration and defense and other services (or government services). In other words, it is the sum of gross value added.

ii. Income Method: The people of a country who produce GDP during a year receive incomes from their work. Thus GDP by income method is the sum of all factor incomes: Wages and Salaries (compensation of employees) + Rent + Interest + Profit.

iii. Expenditure Method: This method focuses on goods and services produced within the country during one year.

Expenditure Methode Includes:

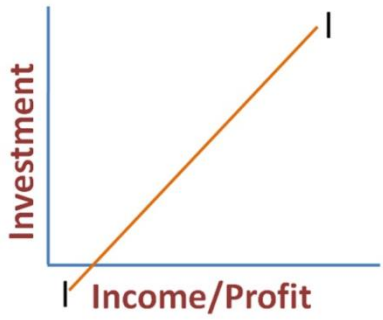
a) Consumer expenditure on services and durable and non-durable goods (C),
b) Investment in fixed capital such as residential and non-residential building, machinery, and inventories (I),
c) Government expenditure on final goods and services (G),
d) Export of goods and services produced by the people of country (X),
e) Less imports (M). That part of consumption, investment and government expenditure which is spent on imports is subtracted from GDP. Similarly, any imported component, such as raw materials, which is used in the manufacture of export goods, is also excluded.

Thus GDP by expenditure method at market prices = C+ I + G + (X – M), where (X-M) is net export which can be positive or negative.

10) What is Induced and autonomous Investments?

Induced Investment: The **Induced Investment** is a capital investment that is influenced by the shifts in the economy. These investments are made with the intention to **generate profit** out of such investments. The change in the cost of raw material, change in the tastes and preferences of customers, increase in the lending or borrowing rates, etc., have a direct impact on the induced investments and to comply with these shifts, a company put efforts to keep the investments viable.

Such investment is governed by the income and the amount of profit a firm can generate. Thus, there is a direct relationship between the amount of investment and the income and profit earned by the firm. If the income and profit tend to increase, the induced investment also increases and vice-versa. This relationship is shown in the graph below:



The figure shows that induced investment increases with the increase in profit/income and in the case of less income or losses the induced investment can even be negative. Hence, we can say, that when the investment increases due to an increase in profit and production, it is known as induced investment

Autonomous Investment. The **Autonomous Investment** is the capital investment which is independent of the economy shifts. This means, any change in the cost of raw material or any change in the salary and wages of labor etc. has no effect on the autonomous investment.

The autonomous investment is made for the welfare of the society and not for generating profits out of such investments. These investments are independent of the level of income or profit, and hence, any change in the income or profit levels will have no effect on the autonomous investment. This can be shown in the figure below:

The graph shows that autonomous investment remains independent of the level of income and profit and hence is parallel to the X axis. It does not mean that induced investment does not change at all; it can be increased or decreased at the individual's disposal. In such a case, the investment curve I-I either shifts upwards or downwards.

11) What is gross and net investment?

Gross Investment: The total addition made to the capital stock of economy in a given period is termed as Gross Investment. Capital stock consists of fixed assets and unsold stock. So, gross investment is the expenditure on purchase of fixed assets and unsold stock during the accounting year. However, gross investment does not indicate the actual change in economy's stock of productive assets for a given year. During the production process, some amount of fixed capital is used up. This loss of fixed capital is known as depreciation. By subtracting depreciation from gross investment, we get Net Investment.

NET INVESTMENT: The actual addition made to the capital stock of economy in a given period is termed as Net Investment.

Net Investment = Gross Investment – Depreciation

12) Explain Demand Pull Inflation.

The **Demand-pull Inflation** occurs when, for a given level of aggregate supply, the aggregate demand increases substantially. In other words, demand-pull inflation exists when the aggregate demand increases rapidly than the aggregate supply.

The increase in aggregate demand may be due to:

- **Monetary Factors,** i.e., an increase in the supply of money
- **Real Factors,** i.e., an increase in the demand for real output

Demand-pull Inflation due to Monetary factors: The increase in money supply more than the increase in potential output is one of the major reasons for **demand-pull inflation.** Let's see how the money supplies causes the demand-pull inflation. At a given level of output, when the monetary and real sectors are in equilibrium, then the economy is also in equilibrium. Since the economy is in general equilibrium, the general price level corresponding to it is called as **equilibrium price level.**

With an increase in the money supply, the other things remaining the same, the real stock of money at each price level increases. As a result, the interest rate decreases and the people's desire to hold money increases. With a decrease in the interest rates, the investment also increases, which leads to more income.

The increase in income causes an increase in the consumption expenditure and thus, a rise in investment and consumption expenditure increases the aggregate demand and aggregate supply, other things remaining the same. This **increase in the aggregate demand is exactly proportional to the**

increase in the money stock. Thus, a rise in aggregate demand, for a given level of aggregate supply, leads to an increase in the general price level in the economy, which may be inflated.

Demand-pull Inflation due to Real Factors: The following are some of the real factors that cause demand-pull inflation in the economy:

- **Increase in government expenditure** without any change in the tax revenue.
- **Cut in the tax rates** without any change in the government expenditure.
- Upward shift in the **Investment Function**
- Downward shift in the **Saving Function**
- Upward shift in the **Export Function**
- Downward shift in the **Import Function**

The first four factors directly contribute towards an increase in the level of disposable income. Since the **aggregate demand being the function of income**, an increase in aggregate income leads to an increase in the aggregate demand, thereby causing the demand-pull inflation. Let's see how real factors cause demand-pull inflation.

13) Explain Cost Pull Inflation.

The **Cost-Push Inflation** occurs when the price rise due to the increase in the price of factors of production, Viz. Labor, raw materials, and other inputs which are essential for the final production of a product. As a result, the aggregate supply decreases, demand remaining the same, an increase in the price of commodities leads to an overall increase in the general price level.

14) Explain Demand for Money.

The demand for money refers to the total amount of wealth held by the household and companies. The demand for money is affected by several factors such as income levels, interest rates, price levels (inflation), and uncertainty.

The impact of these factors on the demand for money is explained in terms of the three primary reasons to hold money. The three reasons are:

i. **Transactions:** This is the money needed for fulfilling transactions. As the total number and size of transactions increases in an economy, the transaction demand for money also increases.

ii. **Precautionary:** This is the money needed for uncertain future needs, for example, unexpected medical expenses. The precautionary demand for money increases as the size of economy increases.

iii. **Speculative:** People also hold money for speculative purposes so that they can take advantage of investment opportunities in the future. If the current returns on financial products are high, people will rather invest than hold money with a speculative motive. We can say that the demand for money for speculative motive increases with the increase in perceived risk in other financial instruments.

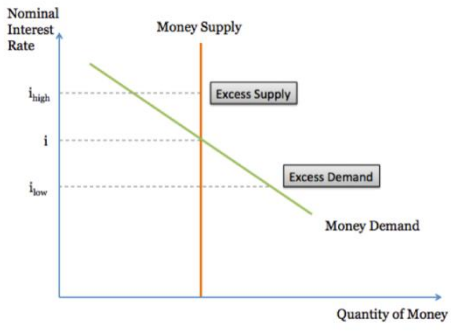
There is an inverse relationship between the short-term interest rates and the demand for money that households and firms want to hold. If the interest rates are low, the demand for money is high and if the interest rates are high, the demand for money is low. This is because as interest rates increase, the opportunity cost of holding money increases, and people will be better off by investing in other financial instruments than holding money.

15) Explain Supply of Money

The supply of money in an economy is controlled by its central bank, for example, Fed in the US. The Fed may change the money supply by using open market operations or by changing reserve requirements.

16) Explain the demand and supply curve for money.

The demand and supply curve for money can be represented as follows:



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As you can see, the money supply curve is completely inelastic. The money demand curve is downward sloping, i.e., the demand for holding money increases with decrease in interest rates

The short-term interest rate (i) is determined by the equilibrium of the supply and demand for money. If the interest rates are above the equilibrium, there is excess supply of money. This means the households and firms are holding more money and they will purchase securities to lower their money balances. This will lead to an increase in security prices and a drop in interest rates. Similarly, if interest rates are lower than the equilibrium rate, there is excess demand for money and people desire to hold money than they actually have. To do so, firms and households will sell securities, which will decrease the security prices and increase the interest rates.

The central bank can change the money supply, which will influence the interest rates. An increase in money supply will create excess supply, which will put a downward pressure on interest rates.

17) What are the problems in measurement of National Income?

i. Exclusion of real Transactions: In measuring national income from the output side only those items which are purchased and sold through the market are included. However, all direct sales of various goods and services are excluded. any useful services are produced by members of households for the benefit of themselves or their families. Husbands and wives perform useful services for themselves and their families when they prepare meals, make household repairs, and handle their own financial affairs. The value of these services is not included in GDP because they do not represent services purchased through market transactions.

ii. The Value of Leisure: All of us place some value on our time. We sell some of our time to employers for labour income; however, we retain much of it for our own use of leisure. Some of this leisure is used to render household services that escape inclusion in GDP. The satisfaction we get from recreational activities and other uses of our leisure time are also not included in GDP.

iii. Cost of environment Damage: The costs of environmental damage are not subtracted from the market value of final products when GDP is calculated. Some economists, therefore, believe that GDP overestimates the value of output by failing to take into account environmental costs of production.

iv. Transfer Payment And Capital Gain: All domestic transfer payments (personal, private and government) are excluded from national income of a country. For example, if an individual

receives a cash gift from his father who is also a resident of India, it will not be a part of India's national income

v. Valuation of Inventories: while estimating national income of a country, one problem has to be faced. This problem arises due to price level changes, i.e., inflation and deflation which lead to stock appreciation or depreciation. And the national income accountants have to face certain problems associated with the valuation of inventories.

18) What is Exchange rate system?

An exchange rate is the value of one nation's currency versus the currency of another nation or economic zone.Exchange rates are the amount of one currency you can exchange for another

Types of Exchange Rate System:

i. Flexible exchange rate system:Flexible exchange rate system refers to a system in which exchange rate is determined by forces of demand and supply of different currencies in the foreign exchange market.The value of currency is allowed to fluctuate freely according to changes in demand and supply of foreign exchange.There is no official (Government) intervention in the foreign exchange market.Flexible exchange rate is also known as 'Floating Exchange Rate

ii. Fixed exchange rate system:Fixed exchange rate system refers to a system in which exchange rate for a currency is fixed by the government.The basic purpose of adopting this system is to ensure stability in foreign trade and capital movements.To achieve stability, government undertakes to buy foreign

currency when the exchange rate becomes weaker and sell foreign currency when the rate of exchange gets stronger.For this, government has to maintain large reserves of foreign currencies to maintain the exchange rate at the level fixed by it

iii. Spot Exchange Rate system: The spot exchange rate is the amount one currency will trade for another today. In other words, it's the price a person would have to pay in one currency to buy another currency today. You could also think of it as today's rate that one currency can be traded with another.

iv. Forward Exchange Rate System: The **forward exchange rate** (also referred to as **forward rate** or **forward price**) is the **exchange rate** at which a bank agrees to **exchange** one **currency** for another at a **future** date when it enters into a **forward** contract with an investor.

19) What is International Monetary system?

An **international monetary system** is a set of **internationally** agreed rules, conventions and supporting institutions that facilitate **international** trade, cross border investment and generally the reallocation of capital between nation states

Stages In International Monetary System

i. **Classic Gold Sytem:** The Gold Standard was a system under which nearly all countries fixed the value of their currencies in terms of a specified amount of gold, or linked their currency to that of a country which did so. Domestic currencies were freely convertible into gold at the fixed price and there was no restriction on the import or export of gold.Gold coins circulated as domestic currency alongside coins of other metals and notes, with the

composition varying by country. As each currency was fixed in terms of gold, exchange rates between participating currencies were also fixed.

ii. **Interwar Period**:The years between the world wars have been described as a period of de-globalization, as both international trade and capital flows shrank compared to the period before World War I. During World War I countries had abandoned the gold standard and, except for the Unites States.The onset of the World Wars saw the end of the gold standard as countries, other than the U.S., stopped making their currencies convertible and started printing money to pay for war related expanses.

After the war, with the high rates of inflation and a large stock of outstanding money, a return to the old gold standard was only possible through a deep recession inducing monetary contraction as practiced by the British after WW I.

iii. **Bretton wood system**:The Bretton Woods Agreement and System created a collective international currency exchange regime that lasted from the mid-1940s to the early 1970s.The Bretton Woods System required a currency peg to the U.S. dollar which was in turn pegged to the price of goldThe Bretton Woods System collapsed in the 1970s but created a lasting influence on international currency exchange and trade through its development of the IMF and World Bank

iv. **Present International System**:The **International Monetary Fund** (**IMF**) is an international organization headquartered in Washington, D.C., consisting of 189 countries working to foster global monetary cooperation, secure financial stability, facilitate international trade, promote high employment and sustainable economic growth, and reduce poverty around the world while periodically depending on the World Bankfor its resources

20) Explain Consumption function

The consumption function or propensity to consume refers to income consumption relationship. It is a "functional relationship between two aggregates, i.e., total consumption and gross national income."

Symbolically, the relationship is represented as C= f(Y), where C is consumption, Y is income, and/is the functional relationship. Thus the consumption function indicates a functional relationship between C and Y, where C is the depend at and Y is the independent variable, i.e., C is determined by Y. This relationship is based on the ceteris paribus (other things being equal) assumption, as such only income consumption relationship is considered and all possible influences on consumption are held constant.

Income(Y)	Consumption C=f(Y)
0	20
60	70
120	120
180	170
240	220
300	270
360	230

Table-1 Consumption Schedule

In fact, propensity to consume or consumption function is a schedule of the various amounts of consumption expenditure corresponding to different levels of income. A hypothetical consumption schedule is given in Table 1.

Table 1 shows that consumption is an increasing function of income because consumption expenditure increases with increase in income. Here it is shown that when income is zero during the depression, people spend out of their past savings on consumption because they must eat in order to live.

When income is generated in the economy to the extent of Rs 60 crores, it is not sufficient to meet the consumption expenditure of the community so that the consumption expenditure of Rs 70 crores is still above the income amounting to Rs 60 crores (Rs 10 crores are dissaved). When both consumption expenditure and income equal Rs 120 crores, it is the basic consumption level. After this, income is shown to increase by 60 crores and consumption by 50 crores. This implies a stable consumption function during the short-run as assumed by Keynes. Figure 1 illustrates the consumption function diagrammatically.

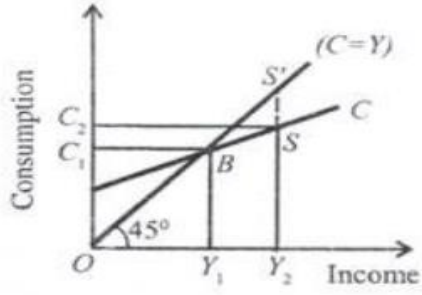


Fig. 1.

In the diagram, income is measured horizontally and consumption is measured vertically. 45° is the unity line where at all levels income and consumption are equal. The C curve is a linear consumption function based on the assumption that consumption changes by the same amount (Rs 50 crores).

Its upward slope to the right indicates that consumption is an increasing function of income. B is the break-even point where C=Y or $OY_1 = OC_1$ When income rises to $0Y_1$ consumption also increases to $0C_2$, but the increase in consumption is less than the increase in income, $C_1C_2 < Y_1Y_2$ The portion of income not consumed is saved as shown by the vertical distance between 45° line and C curve, i.e., SS'.

"Thus the consumption function measures not only the amount spent on consumption but also the amount saved. This is because the propensity to save is merely the propensity not to consume. The 45° line may therefore be regarded as a zero-saving line, and the shape and position of the C curve indicate the division of income between consumption and saving."

BA-ECO_106 (MATHEMATICS FOR ECONOMICS)

1) Find possible maximum and minimum points for:

(a) $f(x) = 3 - (x-2)^2$ (b) $g(x) = \sqrt{x-5} - 100, \quad x \geq 5$

Solution:

Because $(x-2)^2 \geq 0$ for all x, it follows that $f(x) \leq 3$ for all x. But $f(x) = 3$ when $(x-2)^2 = 0$ at $x = 2$. Therefore, $x = 2$ is a maximum point for f . Because $f(x) \to -\infty$ as $x \to \infty$, the function f has no minimum.

(b) Since $\sqrt{x-5}$ is ≥ 0 for all $x \geq 5$, it follows that $f(x) \geq -100$ for all $x \geq 5$. Since $f(5) = -100$, we conclude that $x = 5$ is a minimum point. Since $f(x) \to \infty$ as $x \to \infty$, the function f has no maximum.

Rarely can we find extreme points as simply as in the example. The main task of this chapter is to explain how to locate possible extreme points in more complicated cases. An essential observation is a result which you have already observed: If f is a differentiable function that has a maximum or minimum at an interior point c of its domain, then the tangent line to its graph must be horizontal (parallel to the x-axis) at that point. Hence, $f'(c) = 0$. Points c at which $f'(c) = 0$ are called **stationary** (or **critical**) **points** for f . Precisely formulated, one has the following theorem:

WHAT ARE THE NECESSARY FIRST-ORDER CONDITI

ANS:- Suppose that a function f is differentiable in an interval I and that c is an interior point of I . For x=c to be a maximum or minimum point for f in I , a necessary condition is that it is a stationary point for f —i.e. that x=c satisfies the equation

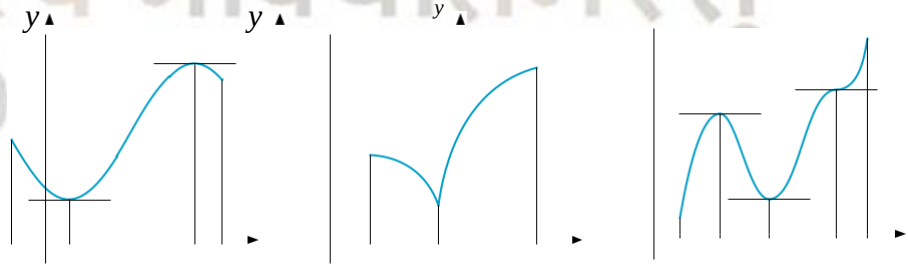
$f'(x) = 0$ (**first-order condition**)

Proof: Suppose thatfhas a maximum atc(the proof in the case whencis a minimum point issimilar). If the absolute value of h is sufficiently small, then $c+h \in I$ because c is an interior point of I .Because c is a maximum point, $f(c+h) - f(c) \leq 0$.If h is sufficiently small and positive, the Newton quotient $[f(c+h) - f(c)]/h \leq 0$. The limit of this quotient as $h \to 0^+$ is therefore

0 as well. But because $f'(c)$ exists, this limit is equal to $f'(c)$, so $f'(c) \leq 0$. For negative values of h, on the other hand, we get $[f(c+h) - f(c)]/h \geq 0$. The limit of this expression as $h \to 0^-$ is therefore ≥ 0. So $f'(c) \geq 0$. We have now proved that $f'(c) \leq 0$ and $f'(c) \geq 0$, so $f'(c) = 0$. ∎

Before starting to explore systematically other properties of maxima and minima, we provide some geometric examples. They will indicate for us the role played by the stationary points of a function in the theory of optimization.

Figure 2 shows the graph of a function f defined in an interval [a, b] having two stationary points, c and d. At c, there is a maximum; at d, there is a minimum.



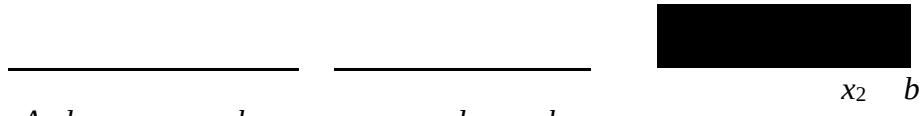


Figure 2 **Figure 3** **Figure 4**

In Fig. 3, the function has no stationary points. There is a maximum at the end point b and a minimum at d. At d, the function is not differentiable. At b, the derivative (the left-hand derivative) is not 0. implies that $f'(x)= 0$ is a *necessary* condition for a differentiable function f to have a maximum or minimum at an interior point x in its domain. The condition is far from sufficient. This is indicated in Fig. 4 where f has three stationary points, x_0, x_1, and x_2. At the end point a there is a minimum, whereas f does not have any maximum value because it approaches ∞ as x tends to b. At the stationary point x_0 the function f has a "local maximum", in the sense that its value at that point is higher than at all neighbouring points. Similarly, at x_1 it has a local "minimum", whereas at x_2 there is a stationary point that is neither a local maximum nor a local minimum. In fact, x_2 is a special case of an *inflection point*.

In many economic problems the only possible maximum and minimum points will occur where the function is indeed stationary, as shown in Fig. 2. Nevertheless, Figs. 3 and 4 illustrate situations that *can* occur, also in economic problems.

Actually, all three figures represent important possibilities that can occur in single-variable optimization problems. Because the theory is so important in economics, we must not simply rely on vague geometric insights. Instead, we must develop a firmer analytical foundation by formulating precise mathematical results.

2) What are Simple Tests for Extreme Points?

ANS:-In many cases we can find maximum or minimum values for a function just by studying the sign of its first derivative. Suppose f (x) is differentiable in an interval I and that it has only one stationary point, x=c. Suppose $f'(x) \geq 0$ for all x in I such that $x \leq c$, whereas $f'(x) \leq 0$ for all x in I such that $x \geq c$. Then f (x) is increasing to the left of c and decreasing to the right of c. It follows that $f(x) \leq f(c)$ for all $x \leq c$, and $f(c) \geq f(x)$ for all $x \geq c$. Hence, x=c is a maximum point for f in I , as illustrated in Fig. 1.

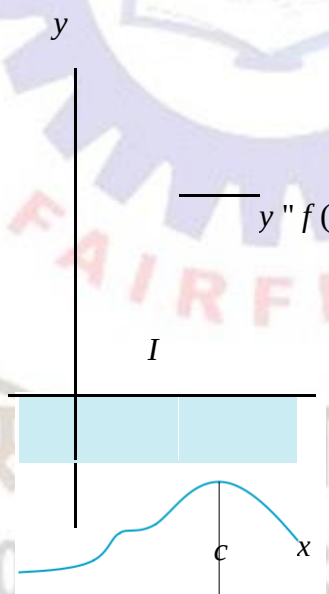


Figure 1 x=cis a maximum point

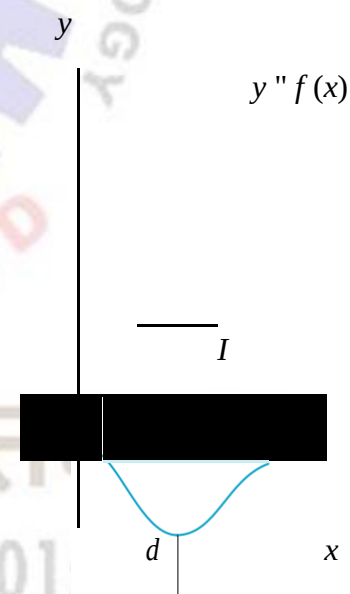


Figure 2 x=dis a minimum point

With obvious modifications, a similar result holds for minimum points, as illustrated in Fig. 2. Briefly stated:[1]

Many books in mathematics for economists instruct students always to check so-called second-order conditions, even when this first-derivative test is much easier to use.

(FIRST-DERIVATIVE TEST FOR MAXIMUM/MINIMUM)

If $f'(x) \geq 0$ for $x \leq c$ and $f'(x) \leq 0$ for $x \geq c$, then $x=c$ is a maximum point for f.

If $f'(x) \leq 0$ for $x \leq c$ and $f'(x) \geq 0$ for $x \geq c$, then $x=c$ is a minimum point for f.

3) Measured in milligrams per litre, the concentration of a drug in the bloodstream t hours after injection is given by the formula

$$c(t) = \frac{t}{\sqrt{t^2 + 4}}, \quad t \geq 0$$

Find the time of maximum concentration.

Solution: Differentiating with respect totyields

$$c'(t) = \frac{1 \cdot (t^2 + 4) - t \cdot 2t}{(t^2 + 4)^2} = \frac{4 - t^2}{(t^2 + 4)^2} = \frac{(2 + t)(2 - t)}{(t^2 + 4)^2}$$

For $t \geq 0$, the term $2 - t$ alone determines the algebraic sign of the fraction, because the other terms are positive. In fact, if $t \leq 2$, then $c'(t) \geq 0$, whereas if $t \geq 2$, then $c'(t) \leq 0$. We conclude that $t = 2$ maximizes $c(t)$. Thus, the concentration of the drug is highest 2 hours after injection. Because $c(2) = 0.25$, the maximum concentration is 0.25 milligrams.

4) What is The Differential of a Function?

ANS:- Consider a differentiable function f (x), and let dx denote an arbitrary change in the variable x. In this notation, "dx" is not a product of d and x. Rather, dx is a single symbol representingthe change in the value of x. The expression $f'(x)\,dx$ is called the **differential** of y=f (x), and it is denoted by dy (or df), so that

$$dy = f'(x)\,dx$$

Note that dy is proportional to dx, with $f'(x)$ as the factor of proportionality.

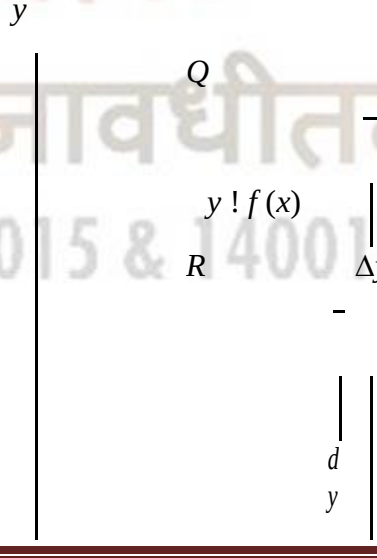
Now, if x changes by dx, then the corresponding change in y=f (x) is

$$y = f(x + dx) - f(x)$$

In the approximation (1), suppose we replace x by x+dx and a by x. The result is

$f(x + dx) \approx f(x) + f'(x)\,dx$. Using the definitions y in (2) and (3) ofdyand above,

we get $y \approx dy = f'(x)\,dx$.



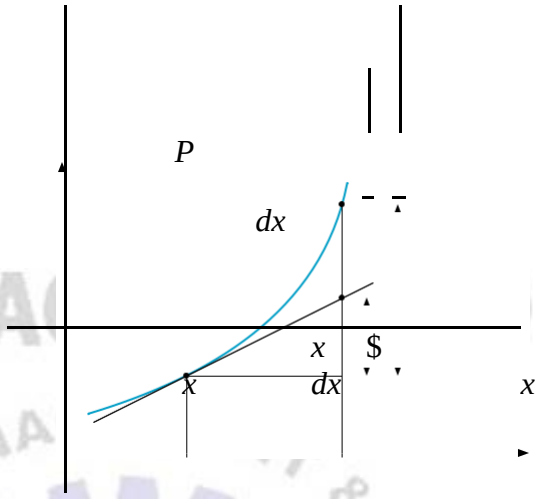


Figure 2 A geometric representation of the differential

dyand $y = f(x + dx) - f(x)$

5)

(i) Y=C+I (ii) C=f (Y)

Find the differential dY expressed in terms of dI . If employment N=g(Y) is also a function of Y , find the differential dN expressed in terms of dI .

Solution: Taking differentials in (i) and (ii), we obtain

dY = dC + dI(iv) dC=f′(Y) dY

Substituting dC from (iv) into (iii) and solving for dY yields

1

$dY = \frac{1}{1 - f'(Y)} dI$

which is the same formula found previously. From N=g(Y), we get dN=g′(Y) dY , so

$$dN = \frac{g'(Y)}{1 - f'(Y)}\, dI$$

Economists usually claim that g′(Y)> 0 (employment increases as national income in-creases) and f′(Y), the marginal propensity to consume, is between 0 and 1. From the for-mula for dN , these claims imply that if investment increases, then employment increases.

6) **Explain Taylor's Formula**

ANS:- The previous section presented polynomial approximations. In particular, the ***n*th-orderTaylor polynomial** approximation off (x)aboutx=0 is

$$f(x) \approx f(0) + \frac{1}{1!} f'(0)x + \frac{1}{2!} f''(0)x^2 + \cdots + \frac{1}{n!} f^{(n)}(0)x^n \qquad (*)$$

Any approximation like (∗) is of limited use unless something is known about the error it implies. Taylor's formula remedies this deficiency. This formula is often used by economists, and is regarded as one of the main results in mathematical analysis.

Consider the approximation in (∗). Except at x= 0, function f (x) and the Taylor polynomial on the RHS of (∗) are usually different. The difference between the two will depend on x as well as on n, and is called the *remainder* after n terms. We denote it by $R_{n+1}(x)$. Hence, by definition,

$$f(x) = f(0) + \frac{1}{1!} f'(0)x + \cdots + \frac{1}{n!} f^{(n)}(0)x^n + R_{n+1}(x)$$

7)

Find Taylor's formula for f (x)=e^x , and estimate the error term for n= 3 and x= 0.1.

Solution: From Example 4 in the previous section, it follows that there exists a numbercbetween 0 and x such that

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \cdots + \frac{x^n}{n!} + \frac{x^{n+1}}{(n+1)!}\, e^c \qquad (6)$$

One can prove that for each fixed number x the remainder term in (6) approaches 0 as n approaches infinity. Using (6) one can therefore find the value of ex for any x to an arbitrary degree of accuracy. However, if |x| is large, a large number of terms have to be used in order to obtain a good degree of accuracy, because the remainder approaches 0 very slowly as n approaches infinity.

For n= 3 and x= 0.1, we obtain for some c in the interval (0, 0.1),

$$e^{0.1} = 1 + \frac{0}{1} + \frac{0}{1} + \frac{0}{20} + \frac{(0.1)^4}{600}\, e^c \qquad (*)$$

For c < 0.1, we have $e^c < e^{0.1}$. We claim that $e^{0.1} < 1.2$. To prove this note that $(1.2)^{10} \approx 6.2 > e$, so $e < (1.2)^{10}$ and thus $e^c < e^{0.1} < ((1.2)^{10})^{0.1} = 1.2$, implying that

$$\frac{1}{(0.1)^4}\, 1.2 = 0.000\,005 = 5 \cdot$$

$4 \qquad 10^{-6}$

$$R_4 \le \frac{1}{0} \cdot \frac{}{24} \cdot \frac{}{e^c < 000} \le \frac{}{240}$$

The error that results from dropping the remainder from $(*)$ is therefore less than $5 \cdot 10^{-6}$.

8) Why Economists Use Elasticities

ANS: - Economists often study how demand for a certain commodity such as coffee reacts to price changes. We can ask by how many units such as kilograms the quantity demanded will change per dollar increase in price. In this way, we obtain a concrete number, measured in units of the commodity per unit of money. There are, however, several unsatisfactory aspects to this way of measuring the sensitivity of demand to price changes. For instance, a $1 increase in the price of a kilo of coffee may be considerable, whereas a $1 increase in the price of a car is insignificant.

This problem arises because the sensitivity of demand to price changes is being measured in the same arbitrary units as those used to measure both quantity demanded and price. The difficulties are eliminated if we use relative changes instead. We ask by what percentage the quantity demanded changes when the price increases by 1%. The number we obtain in

this way will be independent of the units in which both quantities and prices are measured.

This number is called the **price elasticity of demand**, measured at a given price.

In 1960, the price elasticity of butter in a certain country was estimated to be −1. This means that an increase of 1% in the price would lead to a decrease of 1% in the demand, if all the other factors that influence the demand remained constant. The price elasticity for potatoes was estimated to be −0.2. What is the interpretation? Why do you think the absolute value of this elasticity is so much less than that for butter?

Assume now that the demand for a commodity can be described by the function

$$x = D(p)$$

of the price p. When the price changes from pp, the quantity demanded, x, to p+ also

changes. The absolute change in
x is $x = D(p + p) - D(p)$, and the*relative*(or

proportional) change is

$$\frac{x}{x} = \frac{D(p + p) - D(p)}{D(p)}$$

The ratio between the relative change in the quantity demanded and the relative change in the price is

$$\frac{x}{x}\ \frac{p}{p} = \frac{p}{x}\frac{x}{p} = \frac{p}{D(p)}\ \frac{D(p + p) - D(p)}{p} \quad (\qquad)$$

*

When p = p/100 so that p increases by 1%, then (∗) becomes(x/x) · 100, which isthe percentage change in the quantity demanded. We call the proportion in (∗)*the averageelasticity of* x *in the interval* [p, p+p]. Observe that the number defined in(∗)dependsboth on the price change p and on the price p, but is unit-free. Thus, it makes no difference whether the quantity is measured in tons, kilograms, or pounds, or whether the price is measured in dollars, pounds, or euros.

We would like to define the elasticity of D at p so that it does not depend on the size of the increase in p. We can do this if D is a differentiable function of p. For then it is natural

to define the elasticity of D w.r.t. p as the limit of the ratio in (∗) as ptends to 0. Because the Newton quotient [D(p+p)−D(p)]/ p tends to D′(p) as p tends to 0, we obtain:

$$p \quad \frac{dD(p)}{D(p)\,dp}$$

The elasticity of D(p) *with respect to* p *is*

Usually, we get a good approximation to the elasticityp/p = 1/100 = 1% by letting and computingp x/(x p).

NOTE 1 Suppose we consider the Taylor formula on an interval about x=a instead of

= 0. The first n + 1 terms on the right-hand side of (3) become replaced by those of

(7.5.4), and the new remainder is

$$R_{n+1}(x) = \frac{1}{(n+1)!} f^{(n+1)}(c)(x-a)^{n+1} \quad (c \text{ is between } x \text{ and } a) \quad (7)$$

It is easy to show that (7) follows from (1) and (2) by considering the function g defined by g(t) = f (a + t) when t is close to 0.

9) Find the elasticities of the functions given by the following formulas:

(a) $3x^{-3}$ (b) $100x^{100}$ (c) $\sqrt{x}$ (d) $A/x\sqrt{x}$ (A constant)

A study in transport economics uses the relation $T= 0.4K^{1.06}$, where K is expenditure on building roads, and T is a measure of traffic volume. Find the elasticity of T w.r.t. K. In this model, if expenditure increases by 1%, by what percentage (approximately) does traffic volume increase?

(a) A study of Norway's State Railways revealed that, for rides up to 60 km, the price elasticity of the volume of passenger demand was approximately −0.4. According to this study, what is the consequence of a 10% increase in fares?

The corresponding elasticity for journeys over 300 km was calculated to be approximately −0.9. Can you think of a reason why this elasticity is larger in absolute value than theprevious one ?

Use definition (1) to find $El_x y$ for the following (a and p are constants):

(a) $y=e^{ax}$ (b) $y=\ln x$ (c) $y=x^p e^{ax}$ (d) $y=x^p \ln x$

Prove that $El_x(f(x))^p = pEl_x f(x)$ (p is a constant).

The demand D for apples in the US as a function of income r for the period 1927 to 1941 was estimated as $D=Ar^{1.23}$, where A is a constant. Find and interpret the elasticity of D w.r.t. r. (This elasticity is called the income elasticity of demand, or the *Engel elasticity*.)

Voorhees and colleagues studied the transportation systems in 37 American cities and estimated the average travel time to work, m (in minutes), as a function of the number of inhabitants, N . They found that $m=e^{-0.02}N^{0.19}$. Write the relation in log-linear form. What is the value of m when N= 480 000?

Show that

$El_x Af(x) = El_x f(x)$ (multiplicative constants vanish)

$El_x (A + f(x)) = \frac{f(x)\, El_x f(x)}{A + f(x)}$ (additive constants remain)

9)

Evaluate $\int 8x^2(3x^3-1)^{16}dx$.

Solution: Substitute $u=3x^3-1$. Then $du=9x^2dx$, so that $8x^2dx=\frac{8}{9}du$.

9 Hence

$$\int_8^8 (3x^3 - 1)^{16}\, dx = \frac{1}{9}\int_8^8 u^{16}\, du = \frac{1}{9}\cdot\frac{1}{17}u^{17} + C = \frac{1}{153}(3x^3-1)^{17}+C$$

The definite integral in Example 1(b) can be evaluated more simply by "carrying over" the limits of integration. We substituted $u=-cx^2$. As x varies from 0 to a, so u varies from 0 to $-ca^2$. This allows us to write:

$$\int_0^a xe^{-cx^2}dx = \frac{-1}{2c}\int_0^{-ca^2} e^u\, du = \frac{-1}{2c}\Big|_0^{-ca^2} e^u = \frac{1}{2c}(1 - e^{-ca^2})$$

This method of carrying over the limits of integration can be used in general. In fact,

$$\int_a^b f(g(x))\,g'(x)\,dx = \int_{g(a)}^{g(b)} f(u)\,du \qquad (u = g(x)) \qquad (2)$$

The argument is simple: Provided that $F'(u)=f(u)$, we obtain

$$\int_a^b f(g(x))\,g'(x)\,dx = F(g(x))\Big|_a^b = F(g(b)) - F(g(a)) = \int_{g(a)}^{g(b)} f(u)\,du$$

10)

Calculate the integral $\int_{-4}^{} \frac{x^4 + 3x^2}{\quad}\, dx$

.

$x^2 + 2x$

Solution: We apply polynomial division to the integrand, which yields (see Example 4.7.6)

$$\begin{array}{r} x^4 + 3x^2 - 4 \\ \hline x^2 + 2x \end{array} \quad \begin{array}{l} 14x+4 \\ \hline x^2 \\ x \quad 7 \end{array}$$

$$x^2 + 2x = - + - x^2 + 2x$$

We can easily integrate the first 3 terms of the RHS to obtain $\int (x^2 - 2x + 7)dx = \frac{1}{3}x^3 - x^2 + 7x +$ constant. The fourth term, however, has a denominator equal to the product of the two degree-one

factorsx and x+ 2. To obtain an integrand we can integrate, we expand this term as

$$\frac{14x+4}{x(x+2)} = \frac{A}{x} + \frac{B}{x+2}$$

— i.e., the sum of two partial fractions, where A andB are constants to be determined. Multiplying each side of the equation by the common denominator x(x+ 2) gives 14x+ 4 =A(x+ 2)+Bx, or equivalently (14 −A−B)x+ 4 − 2A= 0. To make this true for all x≠ 0 and all x≠−2 (points where the fraction is undefined), we require that both the coefficient 14 −A−B of x and also the constant 4 − 2A are 0. Solving these two simultaneous equations gives A= 2 and B= 12. Finally, therefore, we can integrate the fourth remainder term of the integrand to obtain

$$\int \frac{14x+4}{x(x+2)}dx = 2\int \frac{1}{x}dx + 12\int \frac{1}{x+2}dx = 2\ln|x| + 12\ln|x+2| + C$$

$$x^2 + 2x = x + x + 2 = |\quad| + |\quad| + |+$$

Hence, the overall answer is

$$\frac{x^4 + 3x^2 - 4}{x}\,dx = \frac{1}{3}x^3 - 2x + 7\ln|x| + \frac{2}{x} - \frac{12}{x^2} + C$$

$$x^2 + 2x = 3 - \frac{1}{x} + \frac{1}{x^2} + \ln|x| + \frac{2}{x^2} + C$$

This answer, of course, can be verified by differentiation.

11)

Consider the system of nonlinear equations

$$u^2 + v = xy$$

$$uv = -x^2 + y^2 \qquad (*)$$

What has the counting rule to say about this system?

Find the differentials of u and v expressed in terms of dx and dy. What are the partial derivatives of u and v w.r.t. x and y?

The point P=(x, y, u, v)=(1, 0, 1,−1) satisfies system (∗). If x= 1 is increased by 0.01 and y= 0 is increased by 0.02, what is the new value of u, approximately?

Calculate u''_{12} at the point P .

Solution: (a) There are 4 variables and 2 equations, so there should be 2 degrees offreedom. Suppose we choose fixed values for x and y. Then there are two equations for determining the two remaining variables, u and v. For example, if x= 1 and y= 0, then (∗) reduces to $u^2=-v$ and uv=−1, from which we find that $u^3= 1$, so u= 1 and v=−1. For other values of x and y, it is more difficult to find solutions for u and v. However, it seems reasonable to assume that system (∗) defines u=u(x, y) and v=v(x, y) as differentiable functions of x and y, at least if the domain of the pair (x, y) is suitably restricted.

The left- and right-hand sides of each equation in (∗) must be equal functions of x and y. So we can equate the differentials of each side to obtain $d(u^2+v)=d(xy)$ and $d(uv) = d(-x^2 + y^2)$. Using the rules for differentials, we obtain

$2u\,du + \qquad dv = \qquad y\,dx + x\,dy$

$v\,du + u\,dv = -2x\,dx + 2y\,dy$

Note that by the invariance property of the differential in Section 12.9, this system is valid no matter which pair of variables are independent.

We want to solve the system for du and dv. There are two equations in the two unknowns du and dv of the form

$$A\,du + B\,dv = C$$

$$D\,du + E\,dv = F$$

where, for instance, A= 2u, C=y dx+x dy, and so on. Using (2) in Section 2.4, or standard elimination, provided that $v \neq 2u^2$, we find that

$$du = \frac{2x+yu}{2u^2-v}\,dx + \frac{xu-2y}{2u^2-v}\,dy, \qquad dv = \frac{-4xu-yv}{2u^2-v}\,dx + \frac{4uy-xv}{2u^2-v}\,dy$$

From the first of these two equations, we obtain immediately that

$$u_1' = \frac{2x+yu}{2u^2-v}, \qquad u_2' = \frac{xu-2y}{2u^2-v}$$

Similarly, the partial derivatives of v w.r.t. x and y are the coefficients of dx and dy in the expression for dv. So we have found all the first-order partial derivatives.

1

We use the approximation u(x+dx, y+dy)≈u(x, y)+du. Letting x= 1, y= 0, dx = 0.01, anddy = 0.02, we obtain

$$u(1 + 0.01, 0 + 0.02) \approx u(1, 0) + u'_1(1, 0) \cdot 0.01 + u'_2(1, 0) \cdot 0.02$$

$$1 + \tfrac{2}{3} \cdot 0.01 + \tfrac{1}{3} \cdot 0.02 \approx 1 + 0.0133 = 1.0133$$

Note that in this case, it is not easy to find the exact value of u(1.01, 0.02).

(d) We find u''_{12} by using the chain rule as follows:

$$u''_{12} = \frac{\partial}{\partial y}(u'_1) = \frac{\partial}{\partial y}\frac{2x+yu}{2u^2 - v} = \frac{(yu'_2 + u)(2u^2 - v) - (2x + yu)(4uu'_2 - v'_2)}{(2u^2 - v)^2}$$

At the point P where (x, y, u, v)=(1, 0, 1,−1), we obtain u''_{12}= 1/9.

12) Suppose that the two equations

$$(z + 2w)^5 + xy^2 = 2z - yw \qquad (*)$$

$$(1 + z^2)^3 - z^2w = 8x + y^5w^2$$

definez and w as differentiable functions z=ϕ(x, y) and w=ψ(x, y) of x and y in a neigbourhood around (x, y, z, w)=(1, 1, 1, 0).

Compute ∂z/∂x, ∂z/∂y, ∂w/∂x, and ∂w/∂y at (1, 1, 1,0) by finding the differentials of (∗).
Use the results in (a) to find an approximate values of ϕ(1 + 0.1, 1 + 0.2).

Solution:

Equating the differentials of each side of the two equations (∗), treated as functions of (x, y), we obtain

$$5(z+2w)^4(dz+2\,dw)+y^2dx+2xy\,dy=2\,dz-w\,dy-y\,dw$$

$$3(1+z^2)^2 2z\,dz-2zw\,dz-z^2dw=8\,dx+5y^4w^2dy+2y^5w\,d$$

At the particular point (x, y, z, w)=(1, 1, 1, 0) this system reduces to

$$\text{(i) } 3dz + 11dw = -dx - 2dy \qquad \text{(ii) } 24dz - dw = 8\,dx$$

Solving these two equations simultaneously for dz and dw in terms of dx and dy yields

$$dz = \frac{29}{89}\,dx - \frac{2}{267}dy, \quad dw = -\frac{16}{89}\,dx - \frac{16}{89}dy$$

Hence, $\partial z/\partial x = 29/89$, $\partial z/\partial y = -2/267$, $\partial w/\partial x = -16/89$, $\partial w/\partial y = -16/89$.

If x= 1 is increased by dx= 0.1 and y= 1 is increased by dy= 0.2, the associated change in $z=\phi(x, y)$ is approximately $dz=(29/89)\cdot 0.1 - (2/267)\cdot 0.2 \approx 0.03$. Hence $\phi(1 + 0.1, 1 + 0.2)\approx\phi(1, 1)+dz\approx 1 + 0.03 = 1.03$.

13)

A firm produces two different kinds A and B of a commodity. The daily cost of producing

x units of A and y units of B is

$$C(x, y) = 0.04x^2 + 0.01xy + 0.01y^2 + 4x + 2y + 500$$

Suppose that the firm sells all its output at a price per unit of 15 for A and 9 for B. Find the

daily production levels x and y that maximize profit per day.

Solution: Profit per day is $\pi(x, y)=15x+9y-C(x, y)$, so

$$\pi(x, y) = 15x + 9y - 0.04x^2 - 0.01xy - 0.01y^2 - 4x - 2y - 500$$

$$= -0.04x^2 - 0.01xy - 0.01y^2 + 11x + 7y - 500$$

If $x > 0$ and $y > 0$ maximize profit, then (x, y) must satisfy

$$\frac{\partial \pi}{\partial x} = -0.08x - 0.01y + 11 = 0, \quad \frac{\partial \pi}{\partial y} = -0.01x - 0.02y + 7 = 0$$

These two linear equations in x and y have the unique solution x= 100, y= 300, with

(100, 300) = 1100. (We have not proved that this actually is a maximum

14) Suppose that the monopolist in Example 1 has the demand functions

$$P_1 = 100 - Q_1, \qquad P_2 = 80 - Q_2$$

and that the cost function is $C = 6(Q_1 + Q_2)$.

How much should be sold in the two markets to maximize profits? What are the cor-responding prices?

How much profit is lost if it becomes illegal to discriminate?

The authorities in market 1 impose a tax of t per unit sold in market 1. Discuss the consequences.

Solution:

(a) Here a_1= 100, a_2= 80, b_1=b_2= 1, and α= 6. Example 1 gives the answers

$$Q^*_1 = (100 - 6)/2 = 47, Q^*_2 = 37, \quad P_1^* = \tfrac{1}{2}(100 + 6) = 53, \quad P_2^* = 43$$

The corresponding profit is $P_1^*Q^*_1+P_2^*Q^*_2 - 6(Q^*_1+Q^*_2)= 3578$.

If price discrimination is not permitted, then $P_1=P_2=P$, and $Q_1= 100 - P$, $Q_2 = 80 - P$, with total demand $Q = Q_1 + Q_2 = 180 - 2P$. Then $P = 90 - \tfrac{1}{2}Q$,so profits are

$$= 90 - \tfrac{1}{2}Q\ Q - 6Q = 84Q - \tfrac{1}{2}Q^2$$

This has a maximum at Q= 84 when P= 48. The corresponding profit is now 3528, so the loss in profit is 3578 − 3528 = 50.

(c) With the introduction of the tax, the new profit function is

$$\hat{\pi} = (100 - Q_1)Q_1 + (80 - Q_2)Q_2 - 6(Q_1 + Q_2) - tQ_1$$

We easily see that this has a maximum at $\hat{Q}_1= 47 - \tfrac{1}{2}t$, $\hat{Q}_2= 37$, with corresponding prices $\hat{P}_1= 53 + \tfrac{1}{2}t$, $\hat{P}_2= 43$. The tax therefore has no influence on the sales in market 2, while the amount sold in market 1 is lowered and the price in market 1 goes up. The optimal profit is easily worked out:

$$^* = (53 + \tfrac{1}{2}t)(47 - \tfrac{1}{2}t) + 43 \cdot 37 - 6(84 - \tfrac{1}{2}t) - t\,(47 - \tfrac{1}{2}t) = 3578 - 47t + \tfrac{1}{4}t^2$$

So introducing the tax makes the profit fall by $47t - \tfrac{1}{4}t^2$. The authorities in market 1 obtain a tax revenue which is

$$T = tQ\hat{}_1 = t\left(47 - \tfrac{1}{2}t\right) = 47t - \tfrac{1}{2}t^2$$

Thus we see that profits fall by $\frac{1}{2}t^2$ more than the tax revenue. This amount represents the so-called deadweight loss from the tax.

A monopolistic firm faces a downward-sloping demand curve. A *discriminating monopolist* such as in Example 1 faces separate downward-sloping demand curves in two or more isolated markets. A *monopsonistic firm*, on the other hand, faces an upward-sloping supply curve for one or more of its factors of production. Then, by definition, a *discriminating monopsonist* faces two or more upward-sloping supply curves for different kinds of the same input—for example, workers of different race or gender. Of course, discrimination by race or gender is illegal in many countries. The following example, however, suggests one possible reason why firms might want to discriminate if they were allowed to.

15)

Consider the utility maximization problem

max xy+x+ 2y subject to 2x+y=m, x≥ 0, y≥ 0

Ans:- where we have required that the amount of each good is nonnegative. The Lagrangian is L=xy +x +2y −λ(2x +y −m). So the first-order conditions (disregarding the nonnegativity constraints for the moment) are $L'_y = 1 - 2\lambda = 0$, $L'_x = 2 - \lambda = 0$. By eliminating λ, we find that $y = 2x - 3$. Inserting this into the budget constraint gives $2x + 2x + 3 = m$, so $x = \frac{1}{4}(m - 3)$. We easily find the corresponding value of y, and the suggested solution that emerges is $x^* = \frac{1}{4}(m - 3)$, $y^* = \frac{1}{2}(m + 3)$. Note that in the case whenm < 3, then $x^* < 0$, so that the expressions we have found for x^* and y^* do not solve the given problem. The solution in this case is, as shown below, $x^* = 0$, $y^* = m$. (So when income is low, the consumer should spend everything on just one commodity.)

Let us analyse the problem by converting it to one that is unconstrained. To do this, note how the constraint implies that y=m− 2x. In order for both x and y to be nonnegative, one must require 0 ≤x≤m/2 and 0 ≤y≤m. Substituting y=m− 2x into the utility function, we obtain utility as function U (x) of x alone, where

$$U(x) = x(m - 2x) + x + 2(m - 2x) = -2x^2 + (m - 3)x + 2m, \qquad x \in [0, m/2]$$

This is a quadratic function with $x = \frac{1}{4}(m - 3)$ as the stationary point. If m > 3, it is an interior stationary point for the concave function U , so it is a maximum point. If m≤ 3, then $U'(x) = -4x + (m - 3) \leq 0$ for all x≥ 0. Because of the constraint x≥ 0, it follows that U (x) must have its largest value for x= 0.

Optimization problems with inequality constraints are generally known as *nonlinear pro-gramming problems*. Some relatively simple cases are

discussed in Sections 14.8 and 14.9.A much more systematic treatment of nonlinear programming is included in FMEA.

WARNING: One of the most frequently occurring errors in the economics literature (evenin some leading textbooks) concerning the Lagrange multiplier method is the claim that it transforms a constrained optimization problem into one of finding an unconstrained optimum of the Lagrangian. Problem 1 shows that this is wrong. What the method does instead is to transform a constrained optimization problem into one of finding the appropriate stationary points of the Lagrangian. Sometimes these are maximum points, but often they are not.

16)DiscussConcave/Convex Lagrangian

Ans:- If (x_0, y_0) does solve problem (1), then the Lagrangian$L(x, y)=f(x, y)-\lambda(g(x, y)-c)$ is stationary at (x_0, y_0), but L does not necessarily have a maximum (minimum) at (x_0, y_0) (see Problem 14.4.1). Suppose, however, that L(x, y) happens to reach a global maximum at (x_0, y_0) — that is, (x_0, y_0) maximizes L(x, y) among *all*(x, y). Then

$$L(x_0, y_0) = f(x_0, y_0) - \lambda(g(x_0, y_0) - c) \geq L(x, y) = f(x, y) - \lambda(g(x, y) - c) \quad (*)$$

for all (x, y). If (x_0, y_0) also satisfies the constraint $g(x_0, y_0)=c$, then from $(*)$ we conclude that $f(x_0, y_0)\geq f(x, y)$ for all (x, y) such that $g(x, y)=c$. Hence, (x_0, y_0) really does solve the maximization problem (1).

A corresponding result is obtained for the minimization problem in (1), provided that L(x, y) reaches a global minimum at (x_0, y_0).

Next, we recall from Theorem 13.2.1 and Note 13.2.2 that a stationary point (x_0, y_0) for a concave (convex) function really does maximize (minimize) the function. Thus we have the following result:

(CONCAVE/CONVEX LAGRANGIAN)

Consider problem (1) and suppose (x_0, y_0) is a stationary point for the Lagrangian

$L(x, y) = f(x, y) - \lambda(g(x, y) - c)$.

(A) If the Lagrangian is concave, then (x_0, y_0) solves the maximization problem.

(B) If the Lagrangian is convex, then (x_0, y_0) solves the minimization problem.

17) Solve the consumer's demand problem

$$\max U(x, y, z) = x^2y^3z \quad \text{subject to } x + y + z = 12$$

Solution: With $L(x, y, z) = x^2y^3z - \lambda(x+y+z-12)$, the first-order conditions are

$$L'_1 = 2xy^3z - \lambda = 0, \quad L'_2 = 3x^2y^2z - \lambda = 0, \quad L'_3 = x^2y^3 - \lambda = 0 \qquad (*)$$

If *any* of the variables x, y, and z is 0, then $x^2y^3z = 0$, which is *not* the maximum value. So suppose that x, y, and z are all positive. From the two first equations in $(*)$, we have $2xy^3z = 3x^2y^2z$, so $y = 3x/2$. The first and third equations in $(*)$ likewise imply that $z = x/2$. Inserting $y = 3x/2$ and $z = x/2$ into the constraint yields $x + 3x/2 + x/2 = 12$, so $x = 4$. Then $y = 6$ and $z = 2$. Thus, the only possible solution is $(x, y, z) = (4, 6, 2)$.

18 Solve the problem

$$\text{minimize } f(x, y, z) = (x-4)^2 + (y-4)^2 + (z-\tfrac{1}{2})^2 \quad \text{subject to } x + y + z = 12$$

Can you supply a geometric interpretation of the problem?

Solution: The Lagrangian is $L(x, y, z)=(x-4)^2+(y-4)^2+z-2^{12}-\lambda(x^2+y^2-z)$, and the first-order conditions are:

$$L'_1(x, y, z) = x - 4) - 2\lambda x = 0 \quad \text{(i)}$$

$$L'_2(x, y, z) = y - 4) - 2\lambda y = 0 \quad \text{(ii)}$$

$$L'_3(x, y, z) = z - \lambda = 0 \quad \text{(iii)}$$

$$x^2 + y^2 = z \quad \text{(iv)}$$

From (i) we see that $x = 0$ is impossible. Equation (i) thus gives $\lambda = 1 - 4/x$. Inserting this into (ii) and (iii) gives $y=x$ and $z = 2/x$. Using these results, equation (iv) reduces to $2x^2 = 2/x$, that is, $x^3 = 1$, so $x = 1$. It follows that $(x, y, z)=(1, 1, 2)$ is the only solution candidate to the problem.

The expression $(x-4)^2+(y-4)^2+(z-1/2)^2$ measures the square of the distance from the point (4, 4, 1/2) to the point (x, y, z). The set of points (x, y, z) that satisfy $z=x^2+y^2$ is a surface known as a paraboloid, part of which is shown in Fig. 1. The minimization problem is therefore to find that point on the paraboloid which has the smallest (square) distance from (4, 4,1/2). It is "geometrically obvious" that this problem has a solution. On the other hand, the problem of finding the largest distance from (4, 4,1/2) to a point on the paraboloid does not have a solution, because the distance can be made as large as we like.

EXAMPLE 19

Solve the problem

$$\min x^2+y^2+z^2 \quad \text{subject to} \quad x + 2y + z = 30 \quad \text{(i)}$$

$$2x-y-3z = 10 \quad \text{(ii)}$$

Solution: The Lagrangian is

$$L(x, y, z) = x^2 + y^2 + z^2 - \lambda_1(x + 2y + z - 30) - \lambda_2(2x - y - 3z - 10)$$

The first-order conditions (9) require that

$$\frac{\partial L}{\partial x} = 2x - \lambda_1 - 2\lambda_2 = 0 \qquad \text{(iii)}$$

$$\frac{\partial L}{\partial y} = 2y - 2\lambda_1 + \lambda_2 = 0 \qquad \text{(iv)}$$

$$\frac{\partial L}{\partial z} = 2z - \lambda_1 + 3\lambda_2 = 0 \qquad \text{(v)}$$

So there are five equations, (i) to (v), to determine the five unknowns x, y, z, λ_1, and λ_2. Solving (iii) and (iv) simultaneously for λ_1 and λ_2 gives

$$\lambda_1 = \frac{2}{5}x + \frac{4}{5}y, \qquad \lambda_2 = \frac{4}{5}x - \frac{2}{5}Y$$

Inserting these expressions for λ_1 and λ_2 into (v) and rearranging yields

$$x - y + z = 0 \qquad \text{(vi)}$$

This equation together with (i) and (ii) constitutes a system of three linear equations in the unknowns x, y, and z. Solving this system by

elimination gives (x, y, z)=(10, 10, 0). The corresponding values of the multipliers are $\lambda_1 = 12$ and $\lambda_2 = 4$.

Here is a geometric argument to confirm that we have solved the minimization problem. Each of the two constraints represents a plane in ^{3}, and the points satisfying both constraints consequently lie on the straight line where the two planes intersect. Now $x^2+y^2+z^2$ measures (the square of) the distance from the origin to a point on this straight line, which we want to make as small as possible by choosing the point on the line that is nearest to the origin. No maximum distance can possibly exist, but it is geometrically obvious that there is a minimum distance, and it must be attained at this nearest point.

An easier alternative method to solve this particular problem is to reduce it to a one-variable optimization problem by using (i) and (ii) to get $y = 20 - x$ and $z = x - 10$, the equations of the straight line where the planes intersect. Then the square of the distance from the origin is $x^2+y^2+z^2 = x^2+(20-x)^2+(x-10)^2 = 3(x-10)^2+200$, and this function is easily seen to have a minimum when $x = 10$. See also Problem 5.

E X A M P L E 20 Solve the problem

$$\text{minimize } f(x, y, z) = (x-4)^2 + (y-4)^2 + (z-12)^2 \quad \text{subject to } x^2 + y^2 = z^2$$

Can you supply a geometric interpretation of the problem?

Solution: The Lagrangian is $L(x, y, z) = (x-4)^2+(y-4)^2+z-12^2-\lambda(x^2+y^2-z)$, and the first-order conditions are:

$$L'_1(x, y, z) = 2(x-4) - 2\lambda x = 0 \quad \text{(i)}$$

$$L'_2(x, y, z) = 2(y-4) - 2\lambda y = 0 \quad \text{(ii)}$$

$$L'(x, y, z) = \left(1 - \frac{2}{z}\right)\lambda \quad 0 \qquad \text{(iii)}$$

$$3 = -2 + =$$

$$x^2 + y^2 = z \qquad \text{(iv)}$$

From (i) we see that x= 0 is impossible. Equation (i) thus gives $\lambda = 1 - 4/x$. Inserting this into (ii) and (iii) gives y=x and z= 2/x. Using these results, equation (iv) reduces to $2x^2 = 2/x$, that is, $x^3 = 1$, so x= 1. It follows that (x, y, z)=(1, 1, 2) is the only solution candidate to the problem.

The expression $(x-4)^2+(y-4)^2+(z-1/2)^2$ measures the square of the distance from the point (4, 4, 1/2) to the point (x, y, z). The set of points (x, y, z) that satisfy $z=x^2+y^2$ is a surface known as a paraboloid, part of which is shown in Fig. 1. The minimization problem is therefore to find that point on the paraboloid which has the smallest (square) distance from (4, 4,1/2). It is "geometrically obvious" that this problem has a solution. On the other hand, the problem of finding the largest distance from (4, 4,1/2) to a point on the paraboloid does not have a solution, because the distance can be made as large as we like.

Business English-108

The Worldly Philosophers

1. Adam Smith: Life and works

Scottish philosopher Smith, who lived between 1723 and 1790, is best known for his two books the Theory of Moral Sentiments, published in 1759, and his magnum opus, an Inquiry into the Nature and Causes of the Wealth of Nations (thankfully, now abbreviated to The Wealth of Nations) which took him more than ten years to write and was eventually published in 1776.

He was born in Kirkcaldy, on the other side of the Firth of Forth from Edinburgh, in 1723. His father, a customs officer, died before he was born, and so Smith was brought up by his mother. In fact, she actually lived with him in Panmure House, before she died at the ripe old age of 92. He never married.

He was educated at Glasgow University and then won a scholarship to Oxford University, about which he quickly developed a low opinion. "The greater part of the public professors have, for these many years," he said, "given up altogether even the pretence of teaching." (Given some of the "woke" antics I read about going on there today, it seems little has changed.)

Largely self-taught, he left Oxford early in 1746. By 1748, he was lecturing and in 1751 became a professor at Glasgow University. When he published the Theory of Moral Sentiments in 1759, it became so popular that students from all over the world enrolled at Glasgow to be taught by Smith.

Why is he so important and so revered?

Economist Eamonn Butler, who founded the Adam Smith Institute think tank, answers that question when he says: "The Wealth of Nations is one of the world's most

important books. It did for economics what Newton did for physics and Darwin did for biology."

The Wealth of Nations is seen as the first book of economic theory, hence Smith has been nicknamed the father of economics. As Smith largely argued for free markets, non-intervention and clear and simple taxes, he is also nicknamed the father of capitalism. Many of his ideas are still highly pertinent today.

1. The Challenge- Survival and Existence

From the beginning of civilization, human beings have faced the challenge of survival, which depends upon two factors — work and cooperation with others. Since individuals are notably self-centered, the possibility that humans will not remain faithful to work has threatened society's existence. If there are not enough miners to work the mines or if most miners should decide to follow another line of work; if farmers should decide to fish instead of plough and reap; or if an insufficient number of students studied medicine or engineering, the economy would break down. In summary, if the interdependence of human workers should fail at any vital point in the economy, the world would suffer. During the early portion of civilized life, only two methods safeguarded against such an outcome — tradition and command.

2. Tradition

The passage of tasks, or jobs, from generation to generation through custom — a carpenter's child becomes a carpenter or a farmer's offspring take charge of the family farm. This reliance on tradition for the selection of a life's work was especially true of the Middle Ages and is still true in many underdeveloped areas of the world.

Tradition, or the **subsistence economy**, bases itself on family, clan, or tribe. By this system, each unit produces all that it needs, and it consumes all that it produces. In many rural areas of Africa, Asia, and Latin America, the question of who will work and what work will be assigned to whom is settled by custom.

3. Command

The enforcement of economic survival by absolute rule or dictatorship. An example of this principle is the building of the pyramids in ancient Egypt and the carrying out of the Soviet Union's Five-Year Plans in the post-World War II era.

Throughout most of history, one or the other of these two methods has solved the problem of survival. Because the methods are simple and need no economic explanation, there has been no need for economists. Since the Economic Revolution, however, the evolution of a third method — the market system — has presented a more challenging economic puzzle.

4. The Economic Revolution

A system where buyers and sellers, motivated by self-gain, freely conduct business with the goal of making profits. Another name for this arrangement is capitalism. Prompted by neither the "pull of tradition or the whip of authority," free markets are motivated by a single factor — the human urge to acquire goods.

The market system is not the simple exchange of goods which existed in primitive society, nor the commercial fairs of the Middle Ages. Nor is it a farm produce market or a stock exchange. The market system supports and maintains an entire society. Unplanned and slow to evolve, it was brought about through the most far-reaching revolution of the Western world — the Economic Revolution.

Many factors combined to cause the revolution, such as the breakup of the manorial system, the decline of guilds, the acceptance of the concepts of land, labor, and capital, the effects of the Renaissance, scientific advancement, European voyages of discovery and exploration, the emergence of modern nation-states, and the Protestant Reformation, which sanctioned the concept of profit.

The market system emerged only after bitter opposition to change by the people who tried to maintain their role in the status quo. Nevertheless, as the profit motive became respectable, the market system took shape, bringing with it the economists who satisfactorily explained the complexities of the system. In 1776, Adam Smith wrote his amazing masterpiece, Inquiry into the Nature and Causes of the Wealth of Nations, a work which helped society understand how changes in economics were leading toward a new plateau in human history

5. Analyse tradition and market system

Tradition, or the subsistence economy, bases itself on family, clan, or tribe. By this system, each unit produces all that it needs, and it consumes all that it produces. In many rural areas of Africa, Asia, and Latin America, the question of who will work and what work will be assigned to whom is settled by custom.

The planned economy under central authoritarian rule differs from tradition in that the means of production and the authority to make economic decisions belong to the state. Examples existed in ancient Egypt and Babylonia, where massive work projects were organized at the whim of the ruling class. In more recent times, the communist nations which were formed after the Russian Revolution in 1917 have attempted the same large-scale operations as an outgrowth of a centralized authority. In neither instance did individuals actualize their own ideas or goals.

In the market system, or market economy, economic decisions are decentralized: Each member of the labor force chooses which job to follow; each household selects what to buy with its income; and each business decides what to produce, what production methods to use, and where to sell the resulting product. Modern examples exist in the United States, Western Europe, Japan, and Great Britain. This capitalism, which is also called a free or private enterprise system, is named for its use of capital, or investment funds.

None of the three methods, or systems, exists in pure form. Systems practiced today in the United States, Great Britain, Japan, or the Soviet Union are better described as mixed economies, which contain elements of both the market economy and the planned economy. For example, within free enterprise there are obvious government-sanctioned monopolies, such as electric power companies, railroads, and communications systems.

6. Definitions

Economics The study of the ways in which people make a living; the study of human wants and their satisfaction; the science of production, distribution, and consumption of goods and services.

Economic System The rules, laws, customs, and principles which govern the operation of an economy. Each economic system has its own peculiar problems and therefore produces its own solutions.

Economic Activity All action concerned with the creation of goods and services to be in some way consumed.

Consumption The process by which goods and services are utilized in satisfying human needs and wants.

Production The process of creating the goods or services to be consumed.

Physical Distribution The process of getting goods and services into the hands of consumers.

Personal Distribution The division of income among individuals.

Functional Distribution The division of income according to different types . . . wages rent, interest, profit.

Basic Agents (Factors) of Production Land, labor, capital, and management

Land Natural resources.

Labor Human effort.

Capital The physical necessities for production — buildings, machinery, tools, equipment, and supplies. This term commonly refers to the money used to purchase these necessities.

Management The planning, coordination, and direction of production

2. Adam Smith

Adam Smith (1723-90), a quiet, nervous, scholarly Scottish bachelor, taught first at Oxford University and then at the University of Glasgow. He gained fame as a moral philosopher, and during his lifetime, his book The Theory of Moral Sentiments earned the critics' appraisal as his best work. Consequently, he was already well known before publishing his enduring masterpiece, An Inquiry into the Nature and Causes of the Wealth of Nations.

During a three-year tour of Europe as traveling tutor of the stepson of Charles Townshend, Smith met the leading thinkers of the Age of Enlightenment, including Benjamin Franklin and Dr. Samuel Johnson. He was particularly impressed with Francois Quesnay, principal spokesman for the French physiocrats, who believed that wealth arises from production. While traveling, Smith worked on his Wealth of Nations and completed the book in 1776, ten years after his return to Scotland.

The Wealth of Nations, which resembles an encyclopaedia, is far more than a mere textbook on economics. One critic calls it "a history and criticism of all European civilization." Among a host of topics, it discusses the origin and use of money, apprenticeship, statistics, waste, the military, foreign trade, landlords, the clergy, royalty, farming, and "the late disturbances in the American colonies."

The book's 900 pages are demanding reading, for Smith often belabours a point without drawing a conclusion. It is not actually original in the sense that its basic ideas are unique to Smith. The author refers to more than 100 authors in developing his arguments, including Locke and Hume. He borrows heavily from the physiocrats, particularly Quesnay, from whom he takes the doctrine of laissez faire, or "leave it alone." However, the book is a masterpiece because it presents a comprehensive picture of economics — a revolutionary doctrine which views the economy as though it were a living organism.

Briefly, these are Adam Smith's economic laws:

1. How can society depend on capitalism, which is an unregulated market system? Smith replies with two laws of the market. The desire for wealth permeates all human activity. Therefore, self-interest, or profit, motivates people to perform necessary tasks for which society is willing to pay. As Smith writes, "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from our regard to their self-interest." Thus, the first law of the market is self-interest, or the profit motive.

2. But how can the individual's selfish desires benefit society? What stops greed from overwhelming the public, resulting in ruthless exploitation by profiteers? Smith answers that the individual, in the process of providing for personal interests, unintentionally contributes to the economic wellbeing of society. Therefore, the second law of the market is competition. The individual who overcharges for products soon learns that competitors will take away business by offering more reasonable prices. If wages are too small, workers will hire out to another employer who will pay more for their services. Thus, selfish motives are tempered by interaction, resulting in social harmony.

According to Smith, under the market system each worker freely chooses a trade. Through such a multitude of choices, society reaps the benefit of having all its necessary tasks filled. The individual, motivated by self-interest, selects a particular task. Competition for these tasks prevents the individual from over-charging society. Thus, the two laws of the market — self-interest and competition — react upon each other and form a balance, guaranteeing the survival of society.

In addition, the laws of the market not only ensure that prices are competitive, but they also determine the quantities of goods produced. As Smith explains, when the public demands more gloves than shoes, there will be a brisk business in gloves, but little demand for shoes. Consequently, the price of gloves will rise as demand exceeds supply and pushes prices up. The price of shoes will go down because the supply exceeds the demand.

At this point, self-interest becomes a factor. Since there are higher profits in the glove business and a greater need for gloves, new producers begin manufacturing gloves. Workers move from shoe factories to glove factories. The result is that glove production rises and shoe production falls. Before long, the market achieves a balance. As the supply of gloves grows to meet demand, glove prices decrease. As the supply of shoes falls below demand, shoe prices rise. This price increase stimulates shoe production. Therefore, the opposing forces of self-interest and competition balance the market.

Finally, the laws of the market also regulate incomes of producers. When profits in one type of business become unusually large, new producers are attracted to the business — until competition reduces the surplus of profit. In the same way, labor's wages are regulated — workers are attracted to higher paying industry until the labor supply lowers the pay scale to that of comparable jobs. By the same token, the reverse is true — when profits or wages are too low, producers or workers will leave that field for more lucrative areas.

But the key to the operation of the laws of the market is that the market is "its own guardian." It is self-regulating if left alone (laissez faire) so that competition can operate freely without government control and without monopolies.

Does capitalism, or the market system, actually operate in this way? It did during Smith's time, for the business world was a world of atomistic, or elemental, competition. Yet, there was evidence that a large number of people did not profit from the system. Still, even though more than an eighth of England's population in 1720 was poor, Smith insisted that society could not flourish if "the greater part of the numbers are poor and miserable." In his radical view, society was definitely improving. By comparison, the capitalistic world of today differs greatly with its giant corporations and massive labor unions. However, the twin laws of self-interest and competition still form the basis of the market system.

Adam Smith was optimistic in his vision of the future. To him, the society of the market system was dynamic and progressive. During his lifetime, division and specialization of laborgreatly increased productivity. He expressed enthusiasm after his visit to a pin factory which employed only ten people.

Each worker specialized in a single operation; the total daily output was over 48,000 pins. If each worker were to handle all steps involved in the manufacture of pins, the total output per worker would fall to twenty pins per day for a total production of 200 pins. According to Smith, a simple factory worker, in comparison with an African king, lives a more luxurious life as a result of the work of specialized labor.

In his vision of society's economic progress, Smith saw two additional fundamental laws which propelled the market system in an ascending spiral of productivity and away from the "avarice of private greed." These laws he called the law of accumulation and the law of population.

3. The law of accumulation refers to the accumulation of profits, which are put back into production. By accumulating profits, capitalists can purchase additional machinery, which will stimulate further division and specialization of labor, thereby boosting productivity. However, additional machinery means more workers to work them. Eventually this increased demand for workers leads to higher and higher wages until profits vanish. At this point, further accumulations are impossible.

4. The solution to this obstacle is Smith's law of population. Labor, like any other commodity, is subject to demand. As the law of accumulation increases wages for workers, the numbers of the working class will increase. As the population of workers increases, its size becomes a counterforce, pushing wages down. As a result of lower wages, profits for the capitalist will rise again, and accumulation will continue.

Thus, these two evolutionary laws form an endless chain for society through which progress is inevitable. Even though the Law of Population depresses wages toward a subsistence level, it never arrives there. Conditions steadily improve, resulting in further accumulation for further investment. What is the end result? Not a utopia, but the economy, if left alone, will ultimately reach its "promised reward" — a world where poverty and wealth balance each other.

Analysis

To comprehend fully why Smith's Wealth of Nations was a revolutionary book, one must know something of the economy and living conditions in England in 1776. The nation was entering the second of three stages of capitalism.

The first stage, known as commercial capitalism, occurred between 1450 and 1750. It was brought about by the five factors which produced the Economic Revolution and was affected by geographic discoveries, colonization, and increase in overseas trade. The early capitalists were protected by government control, subsidies, and monopolies and made their profits from transporting goods.

The second stage began about 1750 and was made possible by new sources of energy, primarily the steam engine. This invention enabled the factory system to develop through the use of machines for manufacturing and resulted in the rapid growth of wealth. This stage, known as industrial capitalism, which reached its height during the 1850s, resulted as capitalists profited from manufacturing.

The third stage of capitalism began in the last quarter of the nineteenth century. Because of the control and direction of industry by financiers, this stage is known as financial capitalism, with profits coming from investing.

Wealth of Nations appeared in England just as the Industrial Revolution was beginning, a fact unknown to Adam Smith and the capitalistic class of his day. In England, the government controlled practically every sector of the economy, including prices, wages, hours of work, production, and foreign trade. The House of Lords represented the noble families, or landed aristocracy, which controlled the vote as well as public office. Only 3 percent of the population affected the election of members to the less static House of Commons.

For the poor, conditions were abominable. Men, women, and children, stripped to the waist and stooped over in semi-darkness, worked in dank mineshafts. The masses struggled brutally for a meager existence. When wool became a profitable commodity, land owners enclosed new pastures to raise sheep. The process of enclosure, which began in the sixteenth century, reached its height in the nineteenth century, with thousands of tenant farmers thrown off the land in order to make room for the more profitable sheep. Over 1.5 million of England's twelve to thirteen million population

suffered poverty. Yet the grasping aristocracy, who considered the poor a necessary segment of a stable society, opposed any suggestion of a more equitable distribution of wealth.

Mercantilism, the dominant economic concept of the day, upheld the view of government and business that real wealth consisted of gold and silver. Since the reign of Henry VIII, mercantilists sought a strong, self-sufficient economy, protected by a strong central government. Their program called for the following:

- accumulation of gold and silver
- a favorable balance of trade through an excess of exports
- the self-sufficiency of the nation through the utilization of raw materials from either England or her colonies
- colonies to provide raw materials, as well as a market for England's manufactured goods
- low wages and long hours for workers
- high tariffs to protect home industry and to discourage imports
- a strong merchant marine

Adam Smith's Wealth of Nations launched a specific attack on the doctrine of mercantilism. In his celebrated Book IV, he called for free trade and the abolition of economic restraints and monopolies. Forget "balance of trade," he argued. "Wealth does not consist in money, or in gold and silver, but in what money purchases, and is valuable only for purchasing." As opposed to the emphasis on agriculture by the physiocrats, Smith emphasized manufacture. For Smith, the real wealth of nations consists of the goods which they can produce and trade. This condition can be accomplished only by allowing production and commerce to develop freely, without controls.

The replacement of mercantilism with the doctrine of laissez faire did not come immediately with the publication of Smith's views. It was not until the nineteenth century that the Wealth of Nations made its full impact. Then Great Britain discarded mercantilism completely to become the world's wealthiest nation. Unfortunately, the rising industrial capitalists managed to disregard certain stinging accusations in Smith's philosophy, such as "People of the same trade seldom meet together but the conversation ends in a conspiracy against the public, or in some diversion to raise prices . . ."

Adam Smith, in fact, was neither pro-capital nor pro-labor. At the University of Glasgow, he was influenced by the concept of "the greatest happiness of the greatest number." Consequently, he avoided taking sides with any class, concerning himself with the promotion of wealth for all of England's classes.

A principle which his contemporary capitalists chose to ignore was Smith's concept of labor value. His observation that labor is the only real standard of value has been contradicted by most economists, but widely adopted by socialist writers. Some ninety years later, Karl Marx seized and expanded upon this idea, building it into his exaggerated theory of "surplus value."

What British capitalists stressed was Smith's gospel of laissez faire. Ignoring the philosopher's warnings about the dangers of monopoly, they justified resistance to government attempts at social legislation. During this era, child labor was common in poorly ventilated and unsanitary factories; manufacturers shackled children to machines. To quell child labor laws, factory owners quoted Wealth of Nations in defense of deregulation.

Accordingly, Adam Smith's proposals for protective measures for workers, farmers, consumers, and society as a whole; the abolition of slavery; and the control of monopolies were ignored. Capitalists championed the Wealth of Nations as a vindication of corrupt business practices. In this way, Adam Smith, the soft-spoken scholar, became the patron saint

of free enterprise in the capitalistic world. In later times, Adam Smith, by thoroughly describing and explaining the market system, became the father of modern economics.

He founded the school of Classical Economists, whose chief spokesmen were David Ricardo and Thomas Malthus.

UNIT 2

DEATH OF A SALESMAN

1. PLOT

SUMMARY PLOT OVERVIEW

As a flute melody plays, Willy Loman returns to his home in Brooklyn one night, exhausted from a failed sales trip. His wife, Linda, tries to persuade him to ask his boss, Howard Wagner, to let him work in New York so that he won't have to travel. Willy says that he will talk to Howard the next day. Willy complains that Biff, his older son who has come back home to visit, has yet to make something of himself. Linda scolds Willy for being so critical, and Willy goes to the kitchen for a snack.

As Willy talks to himself in the kitchen, Biff and his younger brother, Happy, who is also visiting, reminisce about their adolescence and discuss their father's babbling, which often includes criticism of Biff's failure to live up to Willy's expectations. As Biff and Happy, dissatisfied with their lives, fantasize about buying a ranch out West, Willy becomes immersed in a daydream. He praises his sons, now younger, who are washing his car. The young Biff, a high school football star, and the young Happy

appear. They interact affectionately with their father, who has just returned from a business trip. Willy confides in Biff and Happy that he is going to open his own business one day, bigger than that owned by his neighbor, Charley. Charley's son, Bernard, enters looking for Biff, who must study for math class in order to avoid failing. Willy points out to his sons that although Bernard is smart, he is not "well liked," which will hurt him in the long run.

A younger Linda enters, and the boys leave to do some chores. Willy boasts of a phenomenally successful sales trip, but Linda coaxes him into revealing that his trip was actually only meagerly successful. Willy complains that he soon won't be able to make all of the payments on their appliances and car. He complains that people don't like him and that he's not good at his job. As Linda consoles him, he hears the laughter of his mistress. He approaches The Woman, who is still laughing, and engages in another reminiscent daydream. Willy and The Woman flirt, and she thanks him for giving her stockings.

The Woman disappears, and Willy fades back into his prior daydream, in the kitchen. Linda, now mending stockings, reassures him. He scolds her mending and orders her to throw the stockings out. Bernard bursts in, again looking for Biff. Linda reminds Willy that Biff has to return a football that he stole, and she adds that Biff is too rough with the neighborhood girls. Willy hears The Woman laugh and explodes at Bernard and Linda. Both leave, and though the daydream ends, Willy continues to mutter to himself. The older Happy comes downstairs and tries to quiet Willy. Agitated, Willy shouts his regret about not going to Alaska with his brother, Ben, who eventually found a diamond mine in Africa and became rich. Charley, having heard the commotion, enters. Happy goes off to bed, and Willy and Charley begin to play cards. Charley offers Willy a job, but Willy, insulted, refuses it. As they argue, Willy imagines that Ben enters. Willy accidentally calls Charley Ben. Ben inspects Willy's house and tells him that he has to catch a train soon to look at properties in Alaska. As Willy talks to Ben about the prospect of going to Alaska, Charley, seeing no one there, gets confused and questions

Willy. Willy yells at Charley, who leaves. The younger Linda enters and Ben meets her. Willy asks Ben impatiently about his life. Ben recounts his travels and talks about their father. As Ben is about to leave, Willy daydreams further, and Charley and Bernard rush in to tell him that Biff and Happy are stealing lumber. Although Ben eventually leaves, Willy continues to talk to him.

Back in the present, the older Linda enters to find Willy outside. Biff and Happy come downstairs and discuss Willy's condition with their mother. Linda scolds Biff for judging Willy harshly. Biff tells her that he knows Willy is a fake, but he refuses to elaborate. Linda mentions that Willy has tried to commit suicide. Happy grows angry and rebukes Biff for his failure in the business world. Willy enters and yells at Biff. Happy intervenes and eventually proposes that he and Biff go into the sporting goods business together. Willy immediately brightens and gives Biff a host of tips about asking for a loan from one of Biff's old employers, Bill Oliver. After more arguing and reconciliation, everyone finally goes to bed.

Act II opens with Willy enjoying the breakfast that Linda has made for him. Willy ponders the bright-seeming future before getting angry again about his expensive appliances. Linda informs Willy that Biff and Happy are taking him out to dinner that night. Excited, Willy announces that he is going to make Howard Wagner give him a New York job. The phone rings, and Linda chats with Biff, reminding him to be nice to his father at the restaurant that night.

As the lights fade on Linda, they come up on Howard playing with a wire recorder in his office. Willy tries to broach the subject of working in New York, but Howard interrupts him and makes him listen to his kids and wife on the wire recorder. When Willy finally gets a word in, Howard rejects his plea. Willy launches into a lengthy recalling of how a legendary salesman named Dave Singleman inspired him to go into

sales. Howard leaves and Willy gets angry. Howard soon re-enters and tells Willy to take some time off. Howard leaves and Ben enters, inviting Willy to join him in Alaska. The younger Linda enters and reminds Willy of his sons and job. The young Biff enters, and Willy praises Biff's prospects and the fact that he is well liked.

Ben leaves and Bernard rushes in, eagerly awaiting Biff's big football game. Willy speaks optimistically to Biff about the game. Charley enters and teases Willy about the game. As Willy chases Charley off, the lights rise on a different part of the stage. Willy continues yelling from offstage, and Jenny, Charley's secretary, asks a grown-up Bernard to quiet him down. Willy enters and prattles on about a "very big deal" that Biff is working on. Daunted by Bernard's success (he mentions to Willy that he is going to Washington to fight a case), Willy asks Bernard why Biff turned out to be such a failure. Bernard asks Willy what happened in Boston that made Biff decide not to go to summer school. Willy defensively tells Bernard not to blame him.

Charley enters and sees Bernard off. When Willy asks for more money than Charley usually loans him, Charley again offers Willy a job. Willy again refuses and eventually tells Charley that he was fired. Charley scolds Willy for always needing to be liked and angrily gives him the money. Calling Charley his only friend, Willy exits on the verge of tears.

At Frank's Chop House, Happy helps Stanley, a waiter, prepare a table. They ogle and chat up a girl, Miss Forsythe, who enters the restaurant. Biff enters, and Happy introduces him to Miss Forsythe, continuing to flirt with her. Miss Forsythe, a call girl, leaves to telephone another call girl (at Happy's request), and Biff spills out that he waited six hours for Bill Oliver and Oliver didn't even recognize him. Upset at his father's unrelenting misconception that he, Biff, was a salesman for Oliver, Biff plans to relieve Willy of his illusions. Willy enters, and Biff tries gently, at first, to tell him

what happened at Oliver's office. Willy blurts out that he was fired. Stunned, Biff again tries to let Willy down easily. Happy cuts in with remarks suggesting Biff's success, and Willy eagerly awaits the good news.

Biff finally explodes at Willy for being unwilling to listen. The young Bernard runs in shouting for Linda, and Biff, Happy, and Willy start to argue. As Biff explains what happened, their conversation recedes into the background. The young Bernard tells Linda that Biff failed math. The restaurant conversation comes back into focus and Willy criticizes Biff for failing math. Willy then hears the voice of the hotel operator in Boston and shouts that he is not in his room. Biff scrambles to quiet Willy and claims that Oliver is talking to his partner about giving Biff the money. Willy's renewed interest and probing questions irk Biff more, and he screams at Willy. Willy hears The Woman laugh and he shouts back at Biff, hitting him and staggering. Miss Forsythe enters with another call girl, Letta. Biff helps Willy to the washroom and, finding Happy flirting with the girls, argues with him about Willy. Biff storms out, and Happy follows with the girls.

Willy and The Woman enter, dressing themselves and flirting. The door knocks and Willy hurries The Woman into the bathroom. Willy answers the door; the young Biff enters and tells Willy that he failed math. Willy tries to usher him out of the room, but Biff imitates his math teacher's lisp, which elicits laughter from Willy and The Woman. Willy tries to cover up his indiscretion, but Biff refuses to believe his stories and storms out, dejected, calling Willy a "phony little fake." Back in the restaurant, Stanley helps Willy up. Willy asks him where he can find a seed store. Stanley gives him directions to one, and Willy hurries off.

The light comes up on the Loman kitchen, where Happy enters looking for Willy. He moves into the living room and sees Linda. Biff comes inside and Linda scolds the boys

and slaps away the flowers in Happy's hand. She yells at them for abandoning Willy. Happy attempts to appease her, but Biff goes in search of Willy. He finds Willy planting seeds in the garden with a flashlight. Willy is consulting Ben about a $20,000 proposition. Biff approaches him to say goodbye and tries to bring him inside. Willy moves into the house, followed by Biff, and becomes angry again about Biff's failure. Happy tries to calm Biff, but Biff and Willy erupt in fury at each other. Biff starts to sob, which touches Willy. Everyone goes to bed except Willy, who renews his conversation with Ben, elated at how great Biff will be with $20,000 of insurance money. Linda soon calls out for Willy but gets no response. Biff and Happy listen as well. They hear Willy's car speed away.

In the requiem, Linda and Happy stand in shock after Willy's poorly attended funeral. Biff states that Willy had the wrong dreams. Charley defends Willy as a victim of his profession. Ready to leave, Biff invites Happy to go back out West with him. Happy declares that he will stick it out in New York to validate Willy's death. Linda asks Willy for forgiveness for being unable to cry. She begins to sob, repeating "We're free. . . ." All exit, and the flute melody is heard as the curtain falls.

2. The American Dream

Willy believes wholeheartedly in what he considers the promise of the American Dream—that a "well liked" and "personally attractive" man in business will indubitably and deservedly acquire the material comforts offered by modern American life. Oddly, his fixation with the superficial qualities of attractiveness and likeability is at odds with a grittier, more rewarding understanding of the American Dream that identifies hard work without complaint as the key to success. Willy's interpretation of likeability is superficial—he childishly dislikes Bernard because he considers Bernard a nerd. Willy's blind faith in his stunted version of the American Dream leads to his rapid psychological decline when he is unable to accept the disparity between the Dream and his own life.

1. Abandonment

Willy's life charts a course from one abandonment to the next, leaving him in greater despair each time. Willy's father leaves him and Ben when Willy is very young, leaving Willy neither a tangible (money) nor an intangible (history) legacy. Ben eventually departs for Alaska, leaving Willy to lose himself in a warped vision of the American Dream. Likely a result of these early experiences, Willy develops a fear of abandonment, which makes him want his family to conform to the American Dream. His efforts to raise perfect sons, however, reflect his inability to understand reality. The young Biff, whom Willy considers the embodiment of promise, drops Willy and Willy's zealous ambitions for him when he finds out about Willy's adultery. Biff's ongoing inability to succeed in business furthers his estrangement from Willy. When, at Frank's Chop House, Willy finally believes that Biff is on the cusp of greatness, Biff shatters Willy's illusions and, along with Happy, abandons the deluded, babbling Willy in the washroom.

2. Betrayal

Willy's primary obsession throughout the play is what he considers to be Biff's betrayal of his ambitions for him. Willy believes that he has every right to expect Biff to fulfill the promise inherent in him. When Biff walks out on Willy's ambitions for him, Willy takes this rejection as a personal affront (he associates it with "insult" and "spite"). Willy, after all, is a salesman, and Biff's ego-crushing rebuff ultimately reflects Willy's inability to sell him on the American Dream—the product in which Willy himself believes most faithfully. Willy assumes that Biff's betrayal stems from Biff's discovery of Willy's affair with The Woman—a betrayal of Linda's love. Whereas Willy feels that Biff has betrayed him, Biff feels that Willy, a "phony little fake," has betrayed him with his unending stream of ego-stroking lies.

3. Mythic Figures

Willy's tendency to mythologize people contributes to his deluded understanding of the world. He speaks of Dave Singleman as a legend and imagines that his death must have been beautifully noble. Willy compares Biff and Happy to the mythic Greek figures Adonis and Hercules because he believes that his sons are pinnacles of "personal attractiveness" and power through "well liked"-ness; to him, they seem the very incarnation of the American Dream.

Willy's mythologizing proves quite nearsighted, however. Willy fails to realize the hopelessness of Singleman's lonely, on-the-job, on-the-road death. Trying to achieve what he considers to be Singleman's heroic status, Willy commits himself to a pathetic death and meaningless legacy (even if Willy's life insurance policy ends up paying off, Biff wants nothing to do with Willy's ambition for him). Similarly, neither Biff nor Happy ends up leading an ideal, godlike life; while Happy does believe in the American Dream, it seems likely that he will end up no better off than the decidedly ungodlike Willy.

4. The American West, Alaska, and the African Jungle

These regions represent the potential of instinct to Biff and Willy. Willy's father found success in Alaska and his brother, Ben, became rich in Africa; these exotic locales, especially when compared to Willy's banal Brooklyn neighborhood, crystallize how Willy's obsession with the commercial world of the city has trapped him in an unpleasant reality. Whereas Alaska and the African jungle symbolize Willy's failure, the American West, on the other hand, symbolizes Biff's potential. Biff realizes that he has been content only when working on farms, out in the open. His westward escape from both Willy's delusions and the commercial world of the eastern United States suggests a nineteenth-century pioneer mentality—Biff, unlike Willy, recognizes the importance of the individual.

5. Seeds

Seeds represent for Willy the opportunity to prove the worth of his labor, both as a salesman and a father. His desperate, nocturnal attempt to grow vegetables signifies his shame about barely being able to put food on the table and having nothing to leave his children when he passes. Willy feels that he has worked hard but fears that he will not be able to help his offspring any more than his own abandoning father helped him. The seeds also symbolize Willy's sense of failure with Biff. Despite the American Dream's formula for success, which Willy considers infallible, Willy's efforts to cultivate and nurture Biff went awry. Realizing that his all-American football star has turned into a lazy bum, Willy takes Biff's failure and lack of ambition as a reflection of his abilities as a father.

6. Diamonds

To Willy, diamonds represent tangible wealth and, hence, both validation of one's labor (and life) and the ability to pass material goods on to one's offspring, two things that Willy desperately craves. Correlatively, diamonds, the discovery of which made Ben a fortune, symbolize Willy's failure as a salesman. Despite Willy's belief in the American Dream, a belief unwavering to the extent that he passed up the opportunity to go with Ben to Alaska, the Dream's promise of financial security has eluded Willy. At the end of the play, Ben encourages Willy to enter the "jungle" finally and retrieve this elusive diamond—that is, to kill himself for insurance money in order to make his life meaningful.

UNIT III & IV

7. INEQUALITY REEXAMINED

Inequality Reexamined is a 1992 book by the economist Amartya Sen. In the book Sen evaluates the different perspectives of the general notion of inequality, focusing mainly on his well-known capability approach. The author argues that inequality is a

central notion to every social theory that has stood on time. For only if this basic feature is satisfied can a social theory which advocates a set of social arrangements be plausible. Taken the inequality ingredient for granted, the crucial question becomes: inequality of what? Sen answers this basic question by advocating his preferred notion of equality which is based on the capability for Functions.

There are two kinds of Functions: Elementary and Social. Elementary Functions include being in good health, nourished, sheltered. More complex are Social Functions, which include having self-respect, taking part in the life of the community etc. The Achievement of an individual is the set of these realized Functions. Capability refers to the real options that someone has in order to pursue the subjective Functions they prefer most. Nevertheless, inequalities related to class, gender, communities hinder the extent of human freedom and thus decrease our ability to function. That is why a good society ought to mitigate such discrimination, promoting people's freedom which, is the most valuable element of a satisfactory life.

8. EQUALITY OF WHAT ?

The two central issues in the ethical analysis of equality—'Why equality?' and 'Equality of what?' are addressed. It is noted that ethical plausibility is hard to achieve unless everyone is given equal consideration in some space (or variable) that is important in the ethical theory under consideration. In addition, it is difficult to see how an ethical theory can have general social plausibility without extending equal consideration to all at some level. However, it is argued that the question of 'why equality' is not a central issue in differentiating standard theories, since they are all egalitarian in terms of some space or variable; rather, it is 'equality of what' that is the important issue. The different theories give different answers to the question, 'equality of what' that are distinguishable in principle and involve conceptual different approaches, but whose practical force depends on the empirical importance of the relevant human heterogeneities that make equality in one space diverge from that in another.

9. AMARTYA SEN

Amartya Sen, (born November 3, 1933, Santiniketan, India), Indian economist who was awarded the 1998 Nobel Prize in Economic Sciences for his contributions to welfare economics and social choice theory and for his interest in the problems of society's poorest members. Sen was best known for his work on the causes of famine, which led to the development of practical solutions for preventing or limiting the effects of real or perceived shortages of food.

Sen was educated at Presidency College in Calcutta (now Kolkata). He went on to study at Trinity College, Cambridge, where he received a B.A. (1955), an M.A. (1959), and a Ph.D. (1959). He taught economics at a number of universities in India and England, including the Universities of Jadavpur (1956–58) and Delhi (1963–71), the London School of Economics, the University of London (1971–77), and the University of Oxford (1977–88), before moving to Harvard University (1988–98), where he was professor of economics and philosophy. In 1998 he was appointed master of Trinity College, Cambridge—a position he held until 2004, when he returned to Harvard as Lamont University Professor.

nt University Professor.

Welfare economics seeks to evaluate economic policies in terms of their effects on the well-being of the community. Sen, who devoted his career to such issues, was called the "conscience of his profession." His influential monograph Collective Choice and Social Welfare (1970)—which addressed problems such as individual rights, majority rule, and the availability of information about individual conditions—inspired researchers to turn their attention to issues of basic welfare. Sen devised methods of measuring poverty that yielded useful information for improving economic conditions for the poor. For instance, his theoretical work on inequality provided an explanation for why there are fewer women than men in some poor countries in spite of the fact that

more women than men are born and infant mortality is higher among males. Sen claimed that this skewed ratio results from the better health treatment and childhood opportunities afforded to boys in those countries.

Sen's interest in famine stemmed from personal experience. As a nine-year-old boy, he witnessed the Bengal famine of 1943, in which three million people perished. This staggering loss of life was unnecessary, Sen later concluded. He believed that there was an adequate food supply in India at the time but that its distribution was hindered because particular groups of people—in this case rural labourers—lost their jobs and therefore their ability to purchase the food. In his book Poverty and Famines: An Essay on Entitlement and Deprivation (1981), Sen revealed that in many cases of famine, food supplies were not significantly reduced. Instead, a number of social and economic factors—such as declining wages, unemployment, rising food prices, and poor food-distribution systems—led to starvation among certain groups in society.

10. FUTURE SHOCK

Future Shock is a 1970 book by the futurist Alvin Toffler, in which the author defines the term "future shock" as a certain psychological state of individuals and entire societies. The shortest definition for the term in the book is a personal perception of "too much change in too short a period of time". The book, which became an international bestseller, grew out of an article "The Future as a Way of Life" in Horizon magazine, Summer 1965 issue. The book has sold over 6 million copies and has been widely translated.

Alvin Toffler argued that society is undergoing an enormous structural change, a revolution from an industrial society to a "super-industrial society". This change overwhelms people. He arguing that the accelerated rate of technological and social change leaves people disconnected and suffering from "shattering stress and disorientation"—future shocked. Toffler stated that the majority of social problems are

symptoms of future shock. In his discussion of the components of such shock he popularized the term "information overload."

Alvin Toffler's main thought centers around the idea that modern man feels shock from rapid changes. For example, Toffler's daughter went to shop in New York City and she couldn't find a shop in its previous location. Thus New York has become a city without a history. The urban population doubles every 11 years. The overall production of goods and services doubles each 50 years in developed countries. Society experiences an increasing number of changes with an increasing rapidity, while people are losing the familiarity that old institutions (religion, family, national identity, profession) once provided. The so-called "brain drain" – the emigration of European scientists to the United States – is both an indicator of the changes in society and also one of their causes.

11. Four Things Futurist Alvin Toffler Predicted About Work Back in 1970

When it was published in 1970, Alvin Toffler's Future Shock painted a picture--at times surprising and other times grim--of what future societies would look like. Some of the prophecies, like underwater cities and family-owned spaceships, are still far from reality.

But many of them were spot on. The overall themes discussed by Toffler and his wife, Heidi, who co-authored both of Toffler's follow-up books, are now part of everyday life.

Toffler died in Los Angeles Monday at age 87, but the thoughtfulness and accuracy of his work lives on. "No serious futurist deals in 'predictions,' " he wrote in the Future Shock introduction, instead encouraging readers to think about the book's larger concepts.

When NPR asked him in 2010 why, then, he was a futurist, Toffler replied: "Because it makes you think. It opens up the questions of what's possible. Not necessarily what will be, but what's possible."

Much of what Toffler wrote about related to companies, the economy, and how we do business. Here are four of Toffler's visions for the future of business that turned out to be startlingly accurate.

1. The internet.: One of the driving themes of Toffler's work was that knowledge would become the driving force behind powerful societies--more so even than labor or materials. Toffler wrote that those people, institutions, and civilizations that failed to keep up with the pace of new information would quickly face decline. He predicted the spread of free-flowing information via personal computers and the internet, and brought the term "information overload" into the popular lexicon, a reference to the difficulty people have understanding issues and making decisions because of the overwhelming amounts of data available.

2. The sharing economy.: The Tofflers believed we'd live in a society where there was no reason to own anything. Part of this was dead wrong: Heidi predicted we'd wear clothes made of paper that were disposed of after every use. But other aspects of this concept hit the mark--specifically, the idea that we'd be able to use things as needed and return them when we're done. Zipcar and any of the ride-hailing apps fall under this category, as do Rent the Runway for wedding garb and Airbnb for apartments. It's never been easier to call something your own--for a few days or a few minutes at a time.

3. Telecommuting.: Fewer and fewer jobs today require employees to be physically present in their office. Toffler predicted this and the rise of home offices, writing that homes would one day resemble "electronic cottages" that would allow people greater work-life balance and a richer family life. Today, opinions on

telecommuting policies are decidedly mixed, but there's no denying their prevalence.

4. Businesses without formal structure.Toffler popularized the phrase "adhocracy," a reference to a company that operates without a formal hierarchy. An adhocracy as defined by Toffler is flexible and often horizontally structured. It allows for creativity and adaptability, since employees aren't pigeonholed into certain roles. Many startups today are adhocracies--offering roles that change based on needs and titles that wouldn't fit anywhere on a traditional corporate ladder.