

**Unit 1:**  
**Sets**

1. What is a Universal Set?
2. If  $A = \{3, 5, 7, 9, 10\}$ ,  $B = \{7, 9, 10, 13\}$ , and  $C = \{10, 13, 15\}$ . Find  $(A \cap B) \cap (B \cup C)$ .
3. Given,  $X = \{a, b, c, d\}$  and  $Y = \{f, b, d, g\}$ , determine the final value of  $X - Y$  and  $Y - X$ .
4. If  $U = \{x : x \in \mathbb{N}, x \leq 9\}$ ,  $A = \{x : x \text{ is an even number}, 0 < x < 10\}$ , and  $B = \{2, 3, 5, 7\}$ , what will be the Set  $(A \cup B)$ ?
5. If  $U = \{a, e, i, o, u\}$  and
  - $A = \{a, e, i\}$
  - $B = \{e, o, u\}$
  - $C = \{a, i, u\}$

Verify whether the value is true or not:  $A \cap (B - C) = (A \cap B) - (A \cap C)$ .

6. According to a survey, 73% of Kashmiris actually like apples, while around 65% of them like oranges. Determine the percentage of Kashmiris who like both apples and oranges.
7. In a college, 20 professors teach mathematics or physics. If 12 teach maths and 4 teach both physics and maths, How many teach Physics?
8. **Solve the following equation:  $2/x + 13 = 21$**

**Solve for x and y :**

$$148x + 231y = 527$$

$$231x + 148y = 610$$

9.

10. If the demand and supply curve for computers is:

$$D = 100 - 6P, S = 28 + 3P$$

Where P is the price of computers, what is the quantity of computers bought and sold at equilibrium?

11. Given the following data:

$$\text{WIDGETS } P = 80 - Q \text{ (Demand)}$$

$$P = 20 + 2Q \text{ (Supply)}$$

Given the above demand and supply equations for widgets, find the equilibrium price and quantity.

12. Solve the following:

$$2x + 3y = -2$$

$$5x + 4y + 2 = 0$$

13. Solve the following equations:

$$2a - b = 4 \text{ and } 2b - 3a = 2$$

14. Let set  $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ , and set  $B = \{3, 5, 7, 9, 11, 13\}$ .

Find: (i)  $A \cup B$

(ii)  $A \cap B$

(iii)  $(A \cap B)'$

15. Solve the following simultaneous equations:

$$7m - 9n = 3 \text{ and } 2m - 3n = 1$$

### Unit 3:

### Matrices

1. If  $A$  and  $B$  are two matrices of the order  $3 \times m$  and  $3 \times n$ , respectively, and  $m = n$ , then the order of matrix  $(5A - 2B)$  is

(a)  $m \times 3$

(b)  $3 \times 3$

(c)  $m \times n$

(d)  $3 \times n$

2. If  $\begin{bmatrix} 2p + q & p - 2q \\ 5r - s & 4r + 3s \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$ , then the value of  $p + q - r + 2s$  is

(a) 8

(b) 10

(c) 4

(d) -8

3. If  $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ , then find  $(A^2 - 5A)$ .

4. Find the sum  $3A + 2B$ .

$$A = \begin{bmatrix} 1 & -2 & 0 \\ 0 & -1 & 2 \\ 4 & 3 & -6 \end{bmatrix} \text{ and } B = \begin{bmatrix} -1 & 2 & 1 \\ 0 & -3 & 2 \\ 0 & 1 & -4 \end{bmatrix}$$

### Unit 3: Determinants

1. Find  $|AB|$ , if  $A = \begin{bmatrix} 0 & -1 \\ 0 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 & 5 \\ 0 & 0 \end{bmatrix}$

2. If  $A = \begin{bmatrix} 5 & 6 & -3 \\ -4 & 3 & 2 \\ -4 & -7 & 3 \end{bmatrix}$ , then write the cofactor of the element  $a_{21}$  of its 2nd row.

3. Prove that,  $\det \begin{pmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{pmatrix} = 4a^2b^2c^2$

4. By using the properties of determinants, show that:  $\det \begin{pmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{pmatrix} = (a - b)(b - c)(c - a)$

5. The roots of the equation  $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$  are

### Unit 3:

#### Solving the system of linear equations

1. Solve the following equations by using Cramer's rule

(i)  $2x + 3y = 7; 3x + 5y = 9$

(ii)  $5x + 3y = 17; 3x + 7y = 31$

(iii)  $2x + y - z = 3, x + y + z = 1, x - 2y - 3z = 4$

(iv)  $x + y + z = 6, 2x + 3y - z = 5, 6x - 2y - 3z = -7$

(v)  $x + 4y + 3z = 2, 2x - 6y + 6z = -3, 5x - 2y + 3z = -5$

2. A commodity was produced by using 3 units of labour and 2 units of capital, the total cost is ₹62. If the commodity had been produced by using 4 units of labour and one unit of capital, the cost is ₹56. What is the cost per unit of labour and capital? (Use determinant method).

3. At marina two types of games viz., Horse riding and Quad Bikes riding are available on hourly rent. Keren and Benita spent ₹780 and ₹560 during the month of May.

Name	Number of hours		Total amount spent (in ₹)
	Horse Riding	Quad Bike Riding	
Keren	3	4	780
Benita	2	3	560

4. In a market survey three commodities A, B and C were considered. In finding out the index number some fixed weights were assigned to the three varieties in each of the commodities. The table below provides the information regarding the consumption of three commodities according to the three varieties and also the total weight received by the commodity

Commodity Variety	Variety			Total weight
	I	II	III	
A	1	2	3	11
B	2	4	5	21
C	3	5	6	27

5. Solve the following system of linear equations by matrix inversion method:

(i)  $2x + 5y = -2, x + 2y = -3$

(ii)  $2x - y = 8, 3x + 2y = -2$

(iii)  $2x + 3y - z = 9, x + y + z = 9, 3x - y - z = -1$

(iv)  $x + y + z - 2 = 0, 6x - 4y + 5z - 31 = 0, 5x + 2y + 2z = 13$

6. Find  $x, y, z$  if

$$A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$$

satisfies  $A^T = A^{-1}$ .

7. The prices of three commodities  $A$ ,  $B$  and  $C$  are ₹  $x$ ,  $y$  and  $z$  per units respectively. A person  $P$  purchases 4 units of  $B$  and sells two units of  $A$  and 5 units of  $C$ . Person  $Q$  purchases 2 units of  $C$  and sells 3 units of  $A$  and one unit of  $B$ . Person  $R$  purchases one unit of  $A$  and sells 3 unit of  $B$  and one unit of  $C$ . In the process,  $P, Q$  and  $R$  earn ₹ 15,000, ₹ 1,000 and ₹ 4,000 respectively. Find the prices per unit of  $A, B$  and  $C$ . (Use matrix inversion method to solve the problem.)

### **Unit 3:**

#### **Integration: Indefinite integral**

1. Write the anti-derivative of the following function:  $3x^2+4x^3$
2. Integrate  $1/(1+x^2)$  for limit  $[0,1]$ .
3.  $\int (x^e + e^x + e^e) dx$
4. Evaluate  $\int (4x^3 - 9x^2 + 7x + 3) e^{-x} dx$ .
5. Evaluate  $\int (-6x^3 + 9x^2 + 4x - 3) dx$
6. Evaluate  $\int \left( \frac{8}{x} - \frac{5}{x^2} + \frac{6}{x^3} \right) dx$
7. Evaluate  $\int (x^{\frac{3}{2}} + 2x + 3) dx$

8.  $\int y^2 \sqrt[3]{y} dy$
- 9.

### **Unit 3:**

#### **Integration: Definite integral**

1. If the fixed cost is 100 and marginal cost function is  $6x+3$  , then find the total function.
2. State the use of integration in economics.
3. Evaluate the following definite integrals.

a)  $\int_1^9 (x^{\frac{3}{2}} + 2x + 3)dx$

b)  $\int_1^4 \frac{5}{x^3} dx$

c)  $\int_{-1}^2 (1+3t)t^2 dt$

d)  $\int_1^4 (5x^2 - 8x + 5)dx$

4.

Calculate consumer's surplus if the demand function  $p = 122 - 5x - 2x^2$  and  $x = 6$

5.

The marginal revenue of a company is given by

$$MR = 100 + 20Q + 3Q^2,$$

where  $Q$  is amount of units sold for a period. Find the total revenue function if at  $Q = 2$  it is equal to 260.

6.

The rate of investment is given by

$$I(t) = 6\sqrt{t}.$$

Calculate the capital growth between the 4<sup>th</sup> and the 9<sup>th</sup> years.

7.

For a certain product, the demand function is

$$D(Q) = 1000 - 25Q,$$

and the supply function is

$$S(Q) = 100 + Q^2.$$

Compute the consumer and producer surplus.

8.

Assuming the demand function is

$$D(Q) = 50 - Q$$

and the supply function is

$$S(Q) = 20 + \sqrt{Q},$$

compute the consumer and producer surplus.

9. The marginal cost function of a product is given by  $dC/dx = 100 - 10x + 0.1x^2$  where  $x$  is the output. Obtain the total and the average cost function of the firm under the assumption, that its fixed cost is ₹ 500.
10. Calculate the producer's surplus at  $x = 5$  for the supply function  $p = 7 + x$ .