

ANSWERS

1. SETS AND RELATIONS

Exercise 1.1

- 1) i) $A = \{M, A, R, I, G, E\}$
 ii) $B = \{0, 1, 2, 3, 4\}$
 iii) $C = \{2, 4, 6, 8, \dots\}$
- 2) i) $\{x/x \in W, x \notin N\}$
 ii) $\{x/-3 \leq x \leq 3, x \in Z\}$
 iii) $\{x/x = \frac{n}{n^2+1}, n \in N, n \leq 7\}$
- 3) i) $A \cup B \cup C = \{-\frac{5}{3}, -1, -\frac{1}{2}, \frac{3}{2}, 3\}$
 ii) $A \cap B \cap C = \{ \}$
- 6) i) 45 ii) 10 iii) 10 iv) 25
- 7) i) 132 ii) 63
- 8) i) 1750 ii) 250 iii) 1100
- 9) 42
- 10) i) 114 ii) 38 iii) 188
- 11) $P(A) = \{\{1\}, \{2\}, \{3\}, \{1,2\}, \{2,3\}, \{1,3\}, \{1,2,3\}, \{\phi\}\}$
- 12) i) $\{x/x \in R, -3 < x < 0\}$
 ii) $\{x/x \in R, 6 \leq x \leq 12\}$
 iii) $\{x/x \in R, 6 < x \leq 12\}$
 iv) $\{x/x \in R, -23 \leq x < 5\}$

Exercise 1.2

- 1) $x = 2, y = -2$
- 2) $x = 0, y = \frac{15}{2}$
- 3) i) $A \times B = \{(a,x), (a,y), (b,x), (b,y), (c,x), (c,y)\}$
 ii) $B \times A = \{(x,a), (x,b), (x,c), (y,a), (y,b), (y,c)\}$
 iii) $A \times A = \{(a,a), (a,b), (a,c), (b,a), (b,b), (b,c), (c,a), (c,b), (c,c)\}$
 iv) $B \times B = \{(x,x), (x,y), (y,x), (y,y)\}$
- 4) i) $P \times Q = \{(1,6), (2,6), (3,6), (1,4), (2,4), (3,4)\}$
 ii) $Q \times P = \{(6,1), (6,2), (6,3), (4,1), (4,2), (4,3)\}$
- 5) i) $A \times (B \cap C) = \{(1,5), (1,6), (2,5), (2,6), (3,5), (3,6), (4,5), (4,6)\}$
 ii) $\{(1,5), (1,6), (2,5), (2,6), (3,5), (3,6), (4,5), (4,6)\}$
 iii) $\{(1,4), (1,5), (1,6), (2,4), (2,5), (2,6), (3,4), (3,5), (3,6), (4,4), (4,5), (4,6)\}$
 iv) $\{(1,4), (1,5), (1,6), (2,4), (2,5), (2,6), (3,4), (3,5), (3,6), (4,4), (4,5), (4,6)\}$
- 6) $\{(0,10), (6,8), (8,6), (10,0)\}$
- 7) i) Domain = $\{1,2,3,4,5\}$; Range = $\{4\}$
 ii) Domain = $\{1,2,3,4,5,6,7,8,9,10,11\}$;
 Range = $\{11,10,9,8,7,6,5,4,3,2,1\}$
 iii) Domain = $\{2\}$; Range = $\{4,5,6,7\}$

9) i) $R_1 = \{(2,4), (3,9), (5,25), (7,49), (11,121), (13,169)\}$

Domain = $\{2,3,5,7,11,13\}$

Range = $\{4,9,25,49,121,169\}$

ii) $R_2 = \{(1,1), (2, \frac{1}{2}), (3, \frac{1}{3}), (4, \frac{1}{4}), (5, \frac{1}{5})\}$

Domain = $\{1,2,3,4,5\}$

Range = $\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}\}$

10) Range = $\{2,3,4,5\}$

11) i) $\{(1,3), (2,6), (3,9)\}$

ii) $\{(1,4), (1,6), (2,4), (2,6)\}$

iii) $\{(0,3), (1,2), (2,1), (3,0)\}$

MISCELLANEOUS EXERCISE - 1

- 1) i) $A = \{x/x = 10n, n \in \mathbb{N}, n \leq 5\}$
 ii) $B = \{x/x \text{ is vowel of English alphabets}\}$
 iii) $C = \{x/x \text{ represents day of a week}\}$

- 2) i) $A \cup B = \{1,2,4,6,7,10,11\}$
 ii) $B \cap C = \{\} = \phi$
 iii) $A - B = \{1,10\}$
 iv) $B - C = \{2,4,6,7,11\}$
 v) $A \cup B \cup C = \{1,2,3,4,5,6,7,8,9,10,11,12\}$
 vi) $A \cap (B \cup C) = \{4,7\}$

3) 230

4) 12

5) i) $A \times B = \{(1,2), (1,4), (2,2), (2,4), (3,2), (3,4)\}$

$B \times A = \{(2,1), (2,2), (2,3), (4,1), (4,2), (4,3)\}$

$A \times A = \{(1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3)\}$

$B \times B = \{(2,2), (2,4), (4,2), (4,4)\}$

$(A \times B) \cap (B \times A) = \{(2,2)\}$

ii) $A \times A \times A = \{(-1,-1,-1), (-1,-1,1), (-1,1,-1), (1,-1,-1), (1,-1,1), (1,1,-1), (1,1,1), (-1,1,1)\}$

6) i) R_1 is a relation

ii) R_2 is a relation

iii) R_3 is a relation

iv) R_4 is not a relation

7) Domain = $\{1,2,3,4\}$

Range = $\{4\}$

2. FUNCTION

Exercise 2.1

- 1) a) It is a function
 b) It is not a function
 c) It is not a function
- 2) a) It is not a function
 b) It is a function
 c) It is not a function
 d) It is a function
- 3) a) 1 b) 19 c) $-\frac{1}{4}$ d) $x^2 - x - 1$
 e) $x^2 + 3x + 1$
- 4) a) $\frac{6}{5}$ b) $x = \pm 3$
 c) $x = \frac{1}{2}$ or $x = -\frac{2}{3}$
- 5) $x = 0$ or $x = \pm 3$
- 6) a) $f(3) = 22$ b) $f(2) = 7$ c) $f(0) = 3$

- 7) a) $f(-4) = -18$ b) $f(-3) = -14$
 c) $f(1) = 5$ d) $f(5) = 25$
- 8) a) $9x + 4$ b) 0
 c) 238 d) $\frac{3x+5}{6x-1}$ domain = $R - \{\frac{1}{6}\}$
- 9) a) $50x^2 - 40x + 11$ b) $10x^2 + 13$
 c) $8x^4 + 24x^2 + 21$ d) $25x - 12$

MISCELLANEOUS EXERCISE - 2

- 1) i) Yes, Domain = $\{2,4,6,8,10,12,14\}$
 Range = $\{1,2,3,4,5,6,7\}$
 ii) Not a function
 iii) Yes, Domain = $\{1,3,5\}$,
 Range = $\{1,2\}$
- 2) $f^{-1}(x) = \frac{5(x-2)}{3}$
- 3) $f(-1) = 1$
 $f(-2) = -3$
 $f(0) = \text{does not exist}$
- 4) 2
- 5) $3x^2 - 11x + 15$
- 6) $a = 4, f(4) = 16$
- 7) $a = 3, b = -2$

3. COMPLEX NUMBERS

Exercise 3.1

- 1) i) $3 - i$ ii) $3 + i$
 iii) $-\sqrt{5} + \sqrt{7}i$ iv) $\sqrt{5}i$
 v) $-5i$ vi) $\sqrt{5} + i$
 vii) $\sqrt{2} - \sqrt{3}i$

- 2) i) $a = -4, b = -3$ ii) $a = \frac{-7}{2}, b = \frac{1}{2}$
 iii) $a = \frac{3}{10}, b = \frac{-1}{10}$ iv) $a = \frac{-8}{29}, b = 0$
 v) $a = \frac{11}{19}, b = \frac{2\sqrt{3}}{19}$
 vi) $a = 13, b = 0$
 vii) $a = \frac{23}{13}, b = \frac{15}{13}$

- 4) i) $-i$ ii) 1 iii) i
 iv) 1 v) $-i$ vi) -1
 vii) 0
- 6) i) $2i$ ii) 0
- 7) 1
- 8) i) $x = 1, y = 2$
 ii) $x = -2, y = 2$
- 9) i) 7
 ii) 2

Exercise 3.2

- 1) i) $\pm(1 - 3i)$ ii) $\pm(4 + 3i)$
 iii) $\pm(2 + \sqrt{3}i)$ iv) $\pm(\sqrt{5} + \sqrt{2}i)$
 v) $\pm(\sqrt{3} - i)$
- 2) i) $\frac{-1 \pm \sqrt{7}i}{8}$ ii) $\frac{\sqrt{3} \pm \sqrt{5}i}{4}$
 iii) $\frac{7 \pm \sqrt{11}i}{6}$ iv) $2 \pm 3i$
- 3) i) $x = 2i$ or $x = -5i$
 ii) $x = \frac{1}{2}i$ or $x = -2i$
 iii) $x = -2i$ iv) $x = -2i$

- 4) i) $x = 3 - i$ or $x = -1 + 2i$
 ii) $x = 3\sqrt{2}$ or $x = 2i$
 iii) $x = 3 - 4i$ or $x = 2 + 3i$
 iv) $x = 1 - i$ or $x = \frac{4}{5} - \frac{2}{5}i$

Exercise 3.3

- 1) i) 7 ii) 65 iii) w^2
 2) i) -1 ii) 0 iii) -1
 iv) 0 v) 1

MISCELLANEOUS EXERCISE - 3

- 1) -1
 2) $-3\sqrt{2}$
 3) i) $3 + 8i$ ii) $-4 + 0i$
 iii) $14 - 5i$ iv) $\frac{15}{2} - 10i$
 v) $-30 + 10i$ vi) $\frac{1}{2} + \frac{7}{2}i$
 vii) $\frac{-35}{26} - \frac{45}{26}i$ viii) $\frac{1}{4} + i\frac{\sqrt{15}}{4}$
 ix) $-i$ x) $\frac{8}{5} + \frac{56}{25}i$
 4) i) $x = 2, y = 1$ ii) 3,2
 iii) 17,19 iv) $\frac{28}{61}, \frac{3}{61}$
 v) 4,-2
 5) i) 1 ii) -2 iii) -3
 6) i) $\pm(3 + 5i)$ ii) $\pm(4 - i)$
 iii) $\pm(\sqrt{3} + i)$ iv) $\pm(3 + 3i)$
 v) $\pm(2 - i)$ vi) $\pm\sqrt{2}(2 + i)$

4. SEQUENCES AND SERIES

Exercise 4.1

- 1) i) $t_n = 2(3^{n-1})$ ii) $t_n = (-5)^{n-1}$
 iii) $t_n = (5)^{3/2-n}$ iv) it is not a G.P.
 v) it is not a G.P.
 2) i) $t_7 = \frac{1}{81}$ ii) $t_3 = \frac{7}{2187}$
 iii) $t_6 = -1701$ iv) $r = 3$
 3) $t_{10} = 5^{10}$
 4) $x = \pm \frac{4}{9}$
 5) G.P. with $a = \frac{4}{25}, r = \frac{5}{2}$
 6) 3,6,12 and 12,6,3
 7) $\frac{1}{27}, \frac{1}{3}, 3, 27$ or $27, 3, \frac{1}{3}, \frac{1}{27}$
 8) 1, 2, 4, 8, 16 or 1, -2, 4, -8, 16

Exercise 4.2

- 1) i) $S_n = 3(2^n - 1)$
 ii) $S_n = \frac{p^{2-n}(q^n - p^n)}{q - p}$
 2) i) $S_6 = \frac{266}{243}$
 ii) $a = 3$
 3) i) $n = 5$
 ii) $r = \frac{3}{5}$
 4) i) 635
 ii) $S_{10} = 2046$
 5) i) $\frac{1}{3} \left\{ \frac{10}{9} (10^n - 1) - n \right\}$

$$\text{ii) } \frac{8}{9} \left\{ \frac{10}{9} (10^n - 1) - n \right\}$$

$$6 \quad \text{i) } \frac{4}{9} \left\{ n - \frac{1}{9} [1 - (0.1)^n] \right\}$$

$$\text{ii) } \frac{7}{9} \left\{ n - \frac{1}{9} [1 - (0.1)^n] \right\}$$

$$7 \quad \text{i) } t_n = \frac{5}{9} [1 - (0.1)^n]$$

$$\text{ii) } t_n = \frac{2}{9} \{1 - (0.1)^n\}$$

$$8) \quad t_n = \frac{4}{3} (3^n)$$

Exercise 4.3

$$1) \quad \text{i) Sum to infinity} = 1$$

$$\text{ii) Sum to infinity} = 6$$

$$\text{iii) } \frac{-9}{4}$$

$$\text{iv) Sum to infinity does not exist.}$$

$$2) \quad \text{i) } 0.\overline{32} = \frac{32}{99}$$

$$\text{ii) } 3.\overline{5} = \frac{32}{9}$$

$$\text{iii) } 4.\overline{18} = \frac{46}{11}$$

$$\text{iv) } 0.3\overline{45} = \frac{342}{990} = \frac{19}{55}$$

$$\text{v) } 3.4\overline{56} = \frac{3422}{990} = \frac{1711}{495}$$

$$3) \quad a = 4$$

$$4) \quad r = \frac{6}{11}$$

$$5) \quad \frac{15}{4}, \frac{15}{16}, \frac{15}{64}, \dots$$

Exercise 4.4

$$1) \quad \text{i) Given series is a H.P.}$$

$$\text{ii) Given series is a H.P.}$$

$$\text{iii) Given series is a H.P.}$$

$$2) \quad \text{i) } \frac{1}{3n-1}, \frac{1}{23}$$

$$\text{ii) } \frac{1}{2n+2}, \frac{1}{18}$$

$$\text{iii) } \frac{1}{5n}, \frac{1}{40}$$

$$3) \quad A = 5$$

$$4) \quad H = \frac{24}{5}$$

$$5) \quad G = 60$$

$$6) \quad \frac{1}{9} \text{ and } \frac{1}{11}$$

$$7) \quad -3 \text{ and } 9$$

$$8) \quad 4 \text{ and } 9$$

$$9) \quad 14 \text{ and } 56$$

Exercise 4.5

$$1) \quad \frac{n(4n^2 + 9n - 1)}{6}$$

$$2) \quad \frac{n(2n^2 + n + 1)}{2}$$

$$3) \quad \frac{n(n+3)}{4}$$

$$4) \quad \frac{n(n+1)(n+2)}{12}$$

$$5) \quad \frac{n(16n^2 + 48n + 41)}{3}$$

- 6) $\frac{2n(n+1)(2n+1)}{3}$
 7) 2485
 8) $n(6n^3 + 8n^2 + 3n - 2)$
 9) $n = 48$

MISCELLANEOUS EXERCISE - 4

- 1) $t_{10} = 3072$.
 2) $r = \frac{3}{4}$
 3) $a = \frac{49}{5}, r = \frac{5}{7}$
 4) 5, 10, 20 or 20, 10, 5
 5) $\frac{1}{27}, \frac{1}{3}, 3, 27$ or $27, 3, \frac{1}{3}, \frac{1}{27}$
 6) $\frac{1}{3}, 1, 3, 9, 27$, or $27, 9, 3, 1, \frac{1}{3}$
 7) The sequence is a G.P. $r = 7$
 8) $\frac{2}{9} \left[\frac{10}{9} (10^n - 1) - n \right]$
 9) $t_n = \frac{2}{3} [1 - (0.1)^n]$
 10) $\frac{n(10n^2 + 27n - 1)}{6}$
 11) $\frac{n(n+1)(3n^2 - 17n + 26)}{12}$
 12) $\frac{n(n+1)(n+2)}{18}$
 13) $\frac{n(n+1)(2n+1)}{24}$
 14) $2n(n+1)(n+2)$
 15) 2364
 16) 1275

17) $r = \pm 15$

18) $k = 2$

19) 1

5. STRAIGHT LINE

Exercise 5.1

1. $2x - 4y + 5 = 0$
 2. $9x - y + 6 = 0$
 3. $3x^2 + 3y^2 + 4x - 24y + 32 = 0$
 4. $x^2 + y^2 - 11x - 11y + 53 = 0$
 5. $3x + 4y - 41 = 0$
 6. $x^2 + y^2 - 4x - 11y + 33 = 0$
 7. (a) $(-1, 0)$ (b) $(0, 2)$
 8. (a) $(6, 7)$ (b) $(4, 6)$
 9. $(-3, 11)$
 10. (a) $3X - Y + 6 = 0$
 (b) $X^2 + Y^2 + X + 4Y - 5 = 0$
 (c) $XY = 0$

Exercise 5.2

1. a) Slope of the line AB = 2
 b) Slope of the line CD = $\frac{4}{7}$
 c) Its slope is not defined.
 d) Slope of the line is 0.
 2. $-\frac{3}{2}$
 3. $\frac{1}{\sqrt{3}}$
 4. 1
 5. -1.
 7. 1
 8. $k = 1$

Exercise 5.3

- a) $y = 5$ b) $x = -5$ c) $y = -1$ and $y = 7$
- a) $y = 3$ b) $x = 4$
- a) $x = 2$ b) $y = -3$
- $4x - y - 8 = 0$
- $m = 1, c = -1$
- a) $2x + y - 4 = 0$
b) $2x - 5y + 14 = 0$
c) $2x + 4y - 13 = 0$.
- a) X- intercept 3, Y-intercept 2
b) X- intercept $\frac{2}{3}$, Y-intercept $\frac{3}{2}$
c) X- intercept -6 , Y-intercept 4
- $x + y - 7 = 0$
- a) $5x + y - 15 = 0$
b) $3x + 4y - 14 = 0$
c) $2x - 3y - 1 = 0$

Exercise 5.4

- a) slope $-\frac{2}{3}$, X-intercept 3, Y-intercept 2
b) slope $-\frac{1}{2}$, both the intercepts 0
- a) $2x - y - 4 = 0$, b) $0x + 1y - 4 = 0$
c) $2x + y - 4 = 0$ d) $2x - 3y + 0 = 0$
- $P = \pm 24$
- $(1, -1)$
- $x + 3y = 3$
- 4 units
- $\frac{25}{\sqrt{117}}$ units

- $8x + 13y - 24 = 0$
- $2x + y + 13 = 0, x - 9y + 73 = 0,$
 $11x - 4y - 52 = 0, \left(\frac{-1}{19}, \frac{-10}{19}\right)$

MISCELLANEOUS EXERCISE - 5

- a) $-\frac{7}{2}$ b) $-\frac{1}{4}$ c) -1 d) 4
- a) $\frac{1}{\sqrt{3}}$ b) $\frac{4}{3}$ c) $-\frac{1}{2}$
- a) 22 b) $\frac{5}{3}$ c) 1
- $y = -2x - \frac{8}{3}$, slope $= -2$.
- 1
- 1
- No, point does not satisfy the equation.
- (d) $2x - y = 0$.
- a) $y + 3 = 0$ b) $x + 2 = 0$
c) $y = 5$ d) $x = 3$
- a) $y = 3$ b) $y = 4$
c) $x = 2$
- a) $5x - y + 7 = 0$ b) $13x - y = 25$
c) $x = 7$ d) $x = 0$
e) $3x - 2y = 0$
- $4x - 3y + 12 = 0$
- a) $5x - y - 25 = 0$ b) $\sqrt{3}x - y + 4 = 0$
- a) BC : $3x + y = 9$, CA : $x = 1$,
AB : $x + y = 5$
b) Median AD : $x - y + 3 = 0$,
Median BE : $2x + y = 7$,
Median CF : $5x + y = 11$
c) $x - 3y + 12 = 0, y = 5, x - y + 2 = 0$,
d) $x - 3y + 11 = 0, y = 3, x - y + 5 = 0$

6. DETERMINANTS

Exercise 6.1

- 1) i) 49 ii) -358
 iii) $-27+9i$ iv) -20
 v) -10 vi) 46
 vii) $abc + 2fgh - af^2 - bg^2 - ch^2$
 viii) 0
- 2) i) $x = 2$ ii) $x = \frac{14}{5}$
 iii) $x = 1$ or $x = 2$ or $x = 3$
- 3) i) $x = 2$ or $x = -4$ ii) $x = -1$ or $x = 2$
- 4) $x = -2$
- 5) $x = 11$ and $y = 52$

Exercise 6.2

- 1) i) 0 ii) 0 iii) 0
- 2) $4abc$
- 3) $x = -\frac{7}{3}$
- 4) $x = 0$, or $x = 12$
- 5) $10 \begin{vmatrix} 1 & 2 & 1 \\ 3 & 1 & 7 \\ 3 & 2 & 6 \end{vmatrix}$
- 6) i) 0 ii) 0
- 7) (i) $\begin{vmatrix} c_1 & a_1 & b_1 \\ c_2 & a_2 & b_2 \\ c_3 & a_3 & b_3 \end{vmatrix}$
 (ii) $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$

Exercise 6.3

- 1) i) $x = \frac{5}{3}, y = 1, z = \frac{-4}{3}$
 ii) $x = \frac{1499}{447}, y = \frac{520}{447}, z = \frac{332}{447}$
 iii) $x = 4, y = 7, z = 6$
 iv) $x = \frac{3}{5}, y = \frac{-3}{5}, z = \frac{-1}{2}$
 v) $x=1, y=-2, z=2$
- 2) Rs. 1750, Rs. 1500, Rs. 1750
- 3) Consistent
- 4) i) $k = 16$ ii) $k = \frac{22}{5}$
- 5) i) 13 sq. unit ii) $\frac{35}{2}$ sq. unit
 iii) 25 sq. unit
- 6) $k = 3; k = \frac{-7}{3}$
- 7) $\frac{35}{2}$ sq. unit
- 8) $A(\Delta PQR) = 0$
- 9) 3, 5, 7 are the three required numbers

MISCELLANEOUS EXERCISE - 6

- 1) i) -113 ii) -76
- 2) i) $x = \frac{-1}{3}$ or $x = 2$ ii) $x = \frac{2}{3}$
- 3) 0
- 4) i) 0 ii) LHS = RHS
 iii) LHS = RHS iv) 0
- 5) i) $x = 1, y = 2, z = 1$
 ii) $x = \frac{3}{5}, y = \frac{-3}{5}, z = \frac{-1}{2}$

iii) $x = \frac{9}{2}, y = -\frac{3}{2}, z = \frac{1}{2}$

6) i) $k = 5$ ii) $k = \frac{14}{5}$ or $k = 2$

7) i) 4 sq. unit

ii) $\frac{25}{2}$ sq. unit iii) $\frac{13}{2}$ sq. unit

8) i) $k = 0; k = 8$ ii) $k = 34; k = 1$

II. 1. $\frac{2}{3\sqrt{3}}$ 2. -8

III. 1. $\frac{7}{2}$ 2. 1 3. 24 4. -24

IV. 1. 2 2. $\frac{-1}{3}$

Exercise 7.4

I. 1. $\frac{1}{\log 4} \log\left(\frac{9}{5}\right)$ 2. $\log\left(\frac{15}{2}\right)$ 3. 1

II. 1. $(\log 3)^2$ 2. $e^{\frac{2}{3}}$ 3. $\frac{-2}{3}$

III. 1. $\frac{1}{4} \log\left(\frac{a^3}{b^2}\right)$ 2. $\frac{(\log 2)^2}{\log 3}$

3. $(\log 3)(\log 5)$ 4. $\frac{1}{6}$

IV. 1. $(\log 5)^2$ 2. $(\log 7 - \log 5)^2$

7. LIMITS

Exercise 7.1

I. 1. 1 2. $\frac{-3}{16}$ 3. $\frac{3}{125}$ 4. $\pm \frac{2}{\sqrt{3}}$

II. 1. $\frac{2}{3(\sqrt[3]{7})}$ 2. 4 3. 4

III. 1. $\frac{-1}{6}$ 2. 24 3. $\frac{3}{2}(a+2)^{1/2}$
4. $\frac{15}{2}$

Exercise 7.2

I. 1. $\frac{-1}{4}$ 2. $\frac{-1}{2}$ 3. $\frac{-1}{2}$ 4. $\frac{-1}{2}$

II. 1. $\frac{4}{3}$ 2. 0 3. 0

III. 1. 44 2. 3 3. -3 4. 8

Exercise 7.3

I. 1. $\frac{1}{2\sqrt{6}}$ 2. -1 3. $\sqrt{2}$

MISCELLANEOUS EXERCISE - 7

I. 1) $n = 5$

II. 1) $\frac{5}{3}(a+2)^{2/3}$ 2) n 3) 1

4) $\frac{3}{7}$ 5) 1 6) $-\frac{1}{3}$ 7) $\log 5$

8) $e^{\frac{1}{5}}$ 9) 9 10) $\frac{5}{3}$

11) $\log(abc)$ 12) 1 13) 1

14) $2(\log a)^2$ 15) $(\log 5)^2$ 16) $\frac{2\log a}{\log b}$

17) 100 18) $\frac{-1}{2}$ 19) 3

8. CONTINUITY

Exercise 8.1

- 1) i) Continuous at $x = -2$
ii) Continuous on $\mathbb{R}$ except at $x = 3$
- 2) i) Discontinuous at $x = 2$
ii) Continuous at $x = 1$
- 3) i) Discontinuous at $x = 2$
ii) Continuous at $x = 2$
iii) Continuous at $x = \frac{8}{3}$
iv) Continuous at $x = 3$
- 4) i) $k = \frac{3}{2}$
ii) $k = (\log 5)^2$
iii) $a = 2, b = -4$
iv) $a = \frac{1}{2}, b = \frac{1}{2}$

MISCELLANEOUS EXERCISE - 8

- I) 1) Continuous on its domain except at $x = 5$
2) Continuous
3) Continuous
4) Discontinuous
5) Discontinuous
- II) 1) $k = e^6$, 2) $k = 125$ 3) $k = \frac{3}{2}$
- III) 1) $a = 1$, $b = -1$
2) $a = -1$, $b = -22$
3) $a = \frac{1}{3}$, $b = \frac{3}{2}$

9. DIFFERENTIATION

Exercise 9.1

- I) 1) $12x^{11}$ 2) $-9x^{-10}$
3) $\frac{3}{2}\sqrt{x}$ 4) $\frac{21}{2}\sqrt{x}$
5) 0
- II) 1) $5x^4 + 12x^3$ 2) $\frac{3\sqrt{x}}{2} + \frac{1}{x} - e^x$
3) $\frac{5x^{3/2}}{2} + 7x^{2/5}$ 4) $x^{5/2} + x^{-3/5}$
5) $\frac{9}{2}x^{7/2} + 5x^{3/2} + \frac{1}{2\sqrt{x}}$
- III) 1) $x^2 + 3x^2 \log x$ 2) $\left(x^{5/2} + \frac{5}{2}x^{3/2}\right)e^x$
3) $e^x \left(\frac{1}{x} + \log x\right)$ 4) $3^x x^2 (x \log 3 + 3)$
- IV) 1) $\frac{-4a^2 x}{(x^2 - a^2)^2}$
2) $\frac{-6x^4 + 30x^2 - 24x}{(2x^3 - 4)^2}$
3) $\frac{(x^3 - 5)\frac{1}{x} - \log x \cdot 3x^2}{(x^3 - 5)^2}$
4) $\frac{12e^x}{(3e^x + 2)^2}$
5) $e^x \left[\frac{(x + e^x)(x + 1) - x(1 + e^x)}{(x + e^x)^2} \right]$
- V) 1) $6x$ 2) $\frac{3\sqrt{x}}{2}$
3) $\frac{-2}{(2x + 3)^2}$ 4) $\frac{9}{(2x + 7)^2}$

Exercise 9.2

- I) 1) $\frac{1}{(x+1)^2}$ 2) $1 - \frac{1}{x^2}$
 3) $\frac{-e^x}{(e^x+1)^2}$ 4) $\frac{e^x}{(e^x+1)^2}$
 5) $\frac{\log x - 1}{(\log x)^2}$ 6) $\frac{2^x(\log x \log 2) - \frac{1}{x}}{(\log x)^2}$
 7) $\frac{4e^x}{(2e^x+1)^2}$ 8) $\frac{(2x+1-x^2)e^x+2x}{(e^x+1)^2}$

- II) 1) -3 2) -6 3) -5
 4) $\frac{dc}{dx} = 256$; $AC = \frac{359}{4}$
 5) 25
 6) $MC = 40\log 2$; $AC = 19$
 7) -3
 8) $\frac{dc}{dx} = 20.e^4$; $AC = 5e^4$
 9) $R = 27650$, A.R. = 2765,
 M.R. = 7855
 10) 23
 11) $AC = x + 15 + \frac{81}{x}$, $MC = 2x + 15$.
 at $x = 10$, $MC = 35$ For $AC = MC$ $x = 9$

MISCELLANEOUS EXERCISE - 9

- I. 1) $5x^4$ 2) $\frac{-2}{x^3}$
 3) $\frac{1}{2\sqrt{x}}$ 4) $\frac{3}{2}x^{1/2}$
 5) $-\frac{1}{2x^{\frac{3}{2}}}$ 6) $7^x \log 7$

- II. 1) $2x - \frac{2}{x^3}$ 2) $\left(1 + \frac{1}{\sqrt{x}}\right)$
 3) $1 - \frac{1}{x^2}$ 4) $3x^2 - 4x + \frac{1}{2\sqrt{x}}$
 5) $2x + 2^x \log 2$ 6) $-3 + 2x$
 7) $\frac{1}{(2+x)^2}$ 8) $\frac{-\log x}{x^2}$
 9) $\frac{e^x(x \log x - 1)}{x(\log x)^2}$
 10) $2x^2 \log x + (x^2 + 1) + (x^2 + 1) \log x$

- III. 1) -3. The rate of change of demand is negative it means, the demand will fall when the price becomes Rs. 2/-.
 2) $\frac{-3}{4}$, The rate of change of demand is negative means, the demand falls when the price becomes Rs. 4/-.
 3) 150, The rate of change of supply w.r.t. price is positive means, supply will increase if the price increase.
 4) $AC = x + 4 + \frac{4}{x}$; $MC = 18$
 5) -3 6) -6
 7) -5
 8) $\frac{dc}{dx} = 256$, $AC = \frac{353}{4}$
 9) 23
 10) $AC = x + 15 + \frac{81}{x}$,
 $MC = 2x + 15$ at $x = 10$
 $MC = 35$ for $AC = MC$, $x = 9$

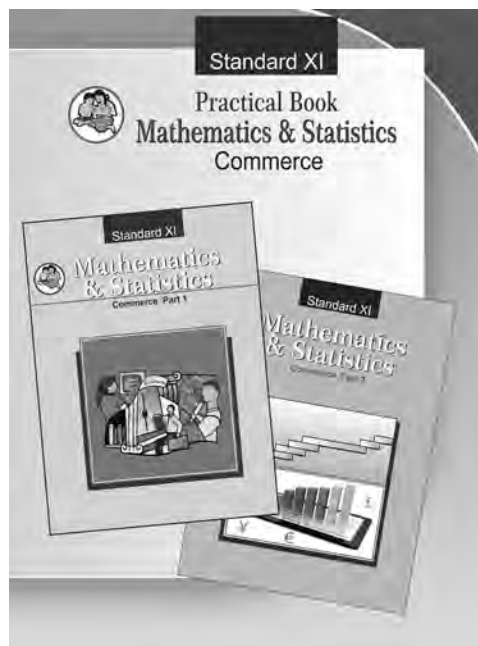


Practical Notebook for Standard XI

Practical Notebook Cum Journal – Mathematics

**English
Medium**

**Price
₹ 52.00**



- Based on Government approved syllabus and textbook
- Inclusion of practicals based on all chapters as per Evaluation scheme.
- With full of various activities, pictures, figures/ diagrams, etc.
- Inclusion of objective/multiple choice questions
- Inclusion of useful questions for oral examination
- More questions for practice and separate space for writing answers

Practical notebooks are available for sale in the regional depots of the Textbook Bureau.

(1) Maharashtra State Textbook Stores and Distribution Centre, Senapati Bapat Marg, Pune 411004 ☎ 25659465
 (2) Maharashtra State Textbook Stores and Distribution Centre, P-41, Industrial Estate, Mumbai - Bengaluru Highway, Opposite Sakal Office, Kolhapur 416122 ☎ 2468576 (3) Maharashtra State Textbook Stores and Distribution Centre, 10, Udyognagar, S. V. Road, Goregaon (West), Mumbai 400062 ☎ 28771842
 (4) Maharashtra State Textbook Stores and Distribution Centre, CIDCO, Plot no. 14, W-Sector 12, Wavanja Road, New Panvel, Dist. Rajgad, Panvel 410206 ☎ 274626465 (5) Maharashtra State Textbook Stores and Distribution Centre, Near Lekhanagar, Plot no. 24, 'MAGH' Sector, CIDCO, New Mumbai-Agra Road, Nashik 422009 ☎ 2391511 (6) Maharashtra State Textbook Stores and Distribution Centre, M.I.D.C. Shed no. 2 and 3, Near Railway Station, Aurangabad 431001 ☎ 2332171 (7) Maharashtra State Textbook Stores and Distribution Centre, Opposite Rabindranath Tagore Science College, Maharaj Baug Road, Nagpur 440001 ☎ 2547716/2523078 (8) Maharashtra State Textbook Stores and Distribution Centre, Plot no. F-91, M.I.D.C., Latur 413531 ☎ 220930 (9) Maharashtra State Textbook Stores and Distribution Centre, Shakuntal Colony, Behind V.M.V. College, Amravati 444604 ☎ 2530965

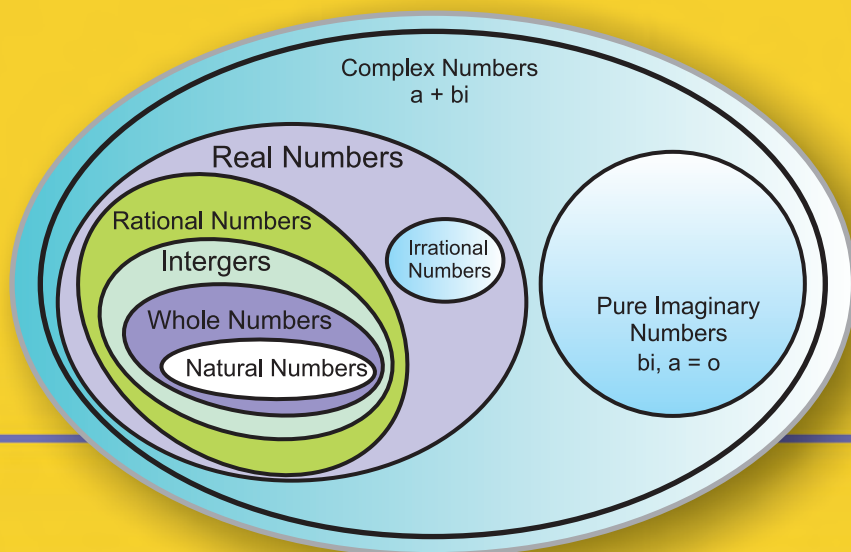


ebalbharati

E-learning material (Audio-Visual) for Standards One to Twelve is available through Textbook Bureau, Balbharati...

- Register your demand by scanning the Q.R. Code given alongside.
 - Register your demand for E-learning material by using Google play store and downloading ebalbharati app.
- www.ebalbharati.in, www.balbharati.in





go to this value

$$\sum_{n=2}^5$$

what to sum

$$n = 2 + 3 + 4 + 5 = 14$$

start at this value



Maharashtra State Bureau of Textbook
Production and Curriculum Research,
Pune - 411 004 ₹ 85.00

इंग्रजी गणित आणि संख्याशास्त्र (वाणिज्य) भाग - १, इ. ११ वी