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, ...}

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}, {ϕ}}

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) $A = \{x/x = 10n, n \in N, n \leq 5\}$

ii) B = {x/x is vowel of English alphabets}

iii) C = {x/x 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) $f(-1) = 1$
$f(-2) = -3$
$f(0)$ = 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) $2 \pm 3\,i$

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

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) $S_n = \frac{p^{2-n}\left(q^n - p^n\right)}{q - p}$

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) $\frac{1}{3}\{\frac{10}{9}(10^n - 1) - n\}$

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

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

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

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

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

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

Exercise 4.3

1) i) Sum to infinity = 1

ii) Sum to infinity = 6

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

iv) Sum to infinity does not exists.

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

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

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

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

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

3) $a=4$

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

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

Exercise 4.4

1) i) Given series is a H.P..

ii) Given series is a H.P.

iii) Given series is a H.P.

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

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

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

3) A=5

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

5) G =60

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

7) –3 and 9

8) 4 and 9

9) 14 and 56

Exercise 4.5

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

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

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

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

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

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) $\frac{2}{9}[\frac{10}{9}(10^n - 1) - n]$

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

1. a) $y = 5$ b) $x = -5$ c) $y = -1$ and $y = 7$
2. a) $y = 3$ b) $x = 4$
3. a) $x = 2$ b) $y = -3$
4. $4x - y - 8 = 0$
5. m = 1, c = –1
6. a) $2x + y - 4 = 0$
   b) $2x - 5y + 14 = 0$
   c) $2x + 4y - 13 = 0$.
7. 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
8. $x + y - 7 = 0$
9. a) $5x + y - 15 = 0$
   b) $3x + 4y - 14 = 0$
   c) $2x - 3y - 1 = 0$

Exercise 5.4

1. a) slope $-\frac{2}{3}$, X-intercept 3, *Y*-intercept 2
   b) slope $-\frac{1}{2}$, both the intercepts 0
2. a) $2x - y - 4 = 0$, b) $0x + 1y - 4 = 0$
   c) $2x + y - 4 = 0$ d) $2x - 3y + 0 = 0$
4. $P = \pm 24$
5. (1, –1)
6. $x + 3y = 3$
7. 4 units
8. $\frac{25}{\sqrt{117}}$ units
9. $8x + 13y - 24 = 0$
10. $2x + y + 13 = 0$, $x - 9y + 73 = 0$, $11x - 4y - 52 = 0$, $\left(\frac{-1}{19}, \frac{-10}{19}\right)$

MISCELLANEOUS EXERCISE - 5

1. a) $-\frac{7}{2}$ b) $-\frac{1}{4}$ c) –1 d) 4
2. a) $\frac{1}{\sqrt{3}}$ b) $\frac{4}{3}$ c) $-\frac{1}{2}$
3. a) 22 b) $\frac{5}{3}$ c) 1
4. $y = -2x - \frac{8}{3}$, slope = –2.
6. 1
7. 1
8. No, point does not satisfy the equation.
9. (d) $2x - y = 0$.
10. a) $y + 3 = 0$ b) $x + 2 = 0$
    c) $y = 5$ d) $x = 3$
11. a) $y = 3$ b) $y = 4$
    c) $x = 2$
12. a) $5x - y + 7 = 0$ b) $13x - y = 25$
    c) $x = 7$ d) $x = 0$
    e) $3x - 2y = 0$
13. $4x - 3y + 12 = 0$
14. a) $5x - y - 25 = 0$ b) $\sqrt{3}x - y + 4 = 0$
15. 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(ΔPQR) = 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) $k = 34$; $k = 1$

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. $\sqrt{2}$

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. $\frac{1}{log4}\log\left(\frac{9}{5}\right)$ 2. $\log\left(\frac{15}{2}\right)$ 3. 1

II. 1. $(log3)^2$ 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. $(log3)\,(log5)$ 4. $\frac{1}{6}$

IV. 1. $(log5)^2$ 2. $(log7 - log5)^2$

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) log5

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

11) log(*abc*) 12) 1 13) 1

14) $2\,(loga)^2$ 15) $(log5)^2$ 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 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) $3^x x^2\left(x\log 3 + 3\right)$

IV) 1) $\frac{-4a^2x}{(x^2 - a^2)^2}$
   2) $\frac{-6x^4 + 30x^2 - 24x}{(2x^3 - 4)^2}$
   3) $\frac{(x^3 - 5)\frac{1}{x} - \log x.3x^2}{(x^3 - 5)^2}$
   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 = 40log2; 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

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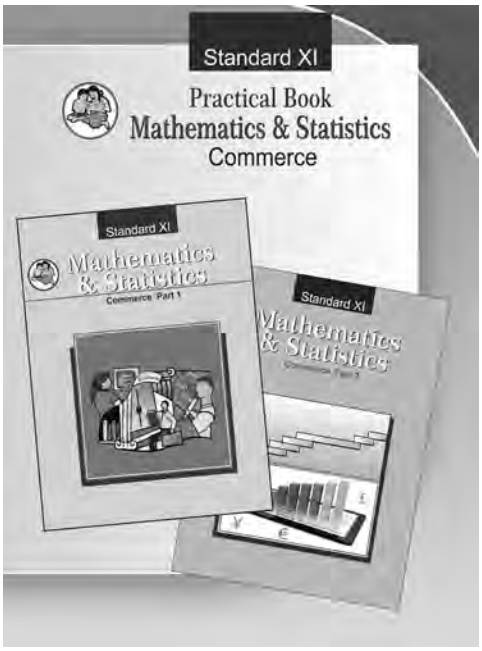

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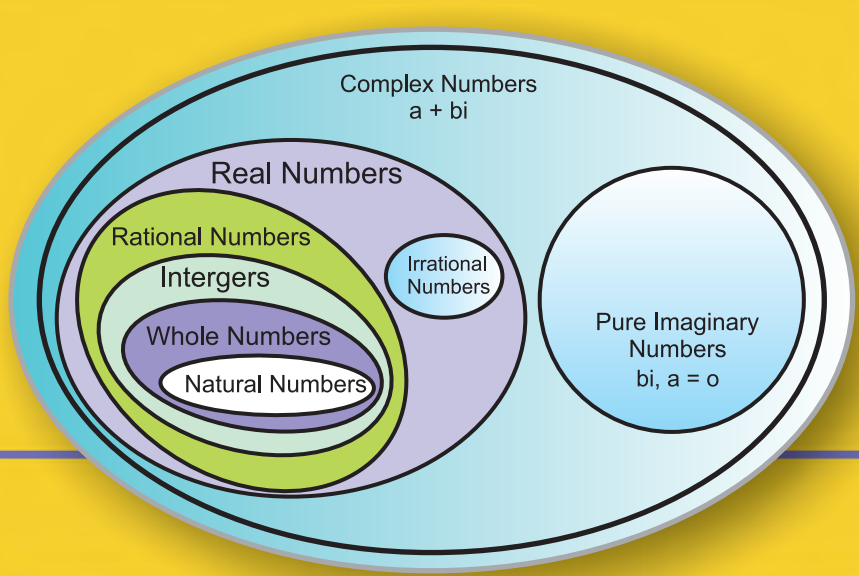

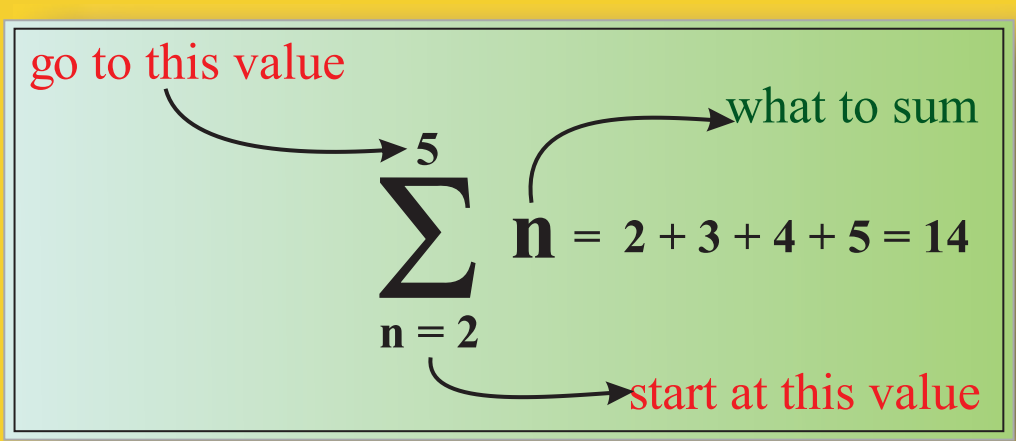

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