

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

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

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

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

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

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

$$8) \quad t_n = 4(3^{n-1})$$

#### Exercise 4.3

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

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

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

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

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

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

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

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

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

$$3) \quad a = 4$$

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

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

#### 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)  $\frac{-4a^2x}{(x^2 - a^2)^2}$   
2)  $\frac{-6x^4 + 30x^2 - 24x}{(2x^3 - 4)^2}$   
3)  $\frac{(x^3 - 5)\frac{1}{x} - \log x \cdot 3x^2}{(x^3 - 5)^2}$   
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  $AC = MC$ ,  $x = 9$

