



ANSWERS



1. COMPLEX NUMBER

EXERCISE 1.1

- Q.1 i) 0 ii) $11i$
- Q.2 i) $(3-i)$ ii) $(3+i)$
 iii) $-\sqrt{5} + \sqrt{7}i$ iv) $\sqrt{5}i$
 v) $-5i$ vi) $(\sqrt{5} + i)$
 vii) $(\sqrt{2} - \sqrt{3}i)$ viii) $\cos\theta - i\sin\theta$
- Q.3 i) $a = 3, b = \frac{1}{2}$ ii) $a = 5, b = 0$
 iii) $a = -3, b = 7$ iv) $a = \pm 2, b = \pm 6$
 v) $a = \frac{3}{13}, b = \frac{2}{13}$
 vi) $a = \frac{3}{2}, b = \frac{-1}{2}$
- Q.4 i) $a = -4, b = -3$ ii) $a = 0, b = 1$
 iii) $a = \frac{-7}{2}, b = \frac{1}{2}$ iv) $a = \frac{3}{10}, b = \frac{-1}{10}$
 v) $a = -1, b = 0$ vi) $a = \frac{-8}{29}, b = 0$
 vii) $a = \frac{-1}{4}, b = \frac{-1}{4}$
 viii) $a = \frac{11}{19}, b = \frac{2\sqrt{3}}{19}$
 ix) $a = \frac{23}{13}, b = \frac{15}{13}$

Q.6 $4 + 6i$

- Q.7 i) $-i$ ii) 1
 iii) i iv) 1
 v) $-i$ vi) -1
 vii) 1 viii) 0

Q.9 i) $2i$ ii) 0

Q.10 -1

Q.11 1

Q.13 Yes, its value $= -2 \in \mathbb{R}$

Q.14 $2i$

Q.16 0

- Q. 24 i) $x = 1, y = 2$ ii) $x = -2, y = 2$
 iii) $x = 1, y = 2$ iv) $x + y = 3$
 v) $x + y = 9$

EXERCISE 1.2

- Q.1 i) $\pm(1-3i)$ ii) $\pm(4+3i)$
 iii) $\pm(2-\sqrt{3}i)$ iv) $\pm(\sqrt{5}+\sqrt{2}i)$
 v) $\pm(\sqrt{3}-i)$ ii) $\pm(\sqrt{5}+\sqrt{2}i)$
- Q.2 i) $\frac{-1+\sqrt{7}i}{8}, \frac{-1-\sqrt{7}i}{8}$
 ii) $\frac{\sqrt{3}+\sqrt{5}i}{4}, \frac{\sqrt{3}-\sqrt{5}i}{4}$

$$\text{iii) } \frac{7+\sqrt{11}i}{6}, \frac{7-\sqrt{11}i}{6} \quad \text{iv) } 2+3i, 2-3i$$

$$\text{Q.3 i) } -5i, 2i \quad \text{ii) } \frac{i}{2}, -2i$$

$$\text{iii) } -2i \quad \text{iv) } -2i$$

$$\text{Q.4 i) } -1+2i, 3-i \quad \text{ii) } 3\sqrt{2}, 2i$$

$$\text{iii) } 2+3i, 3-4i \quad \text{iv) } 1-i, \frac{4}{5}, \frac{-2i}{5}$$

$$\text{Q.5 i) } 7 \quad \text{ii) } 2$$

$$\text{iii) } 7 \quad \text{iv) } 200-264i$$

$$\text{v) } 6$$

EXERCISE 1.3

$$\text{Q.1 i) } \sqrt{74}, -\tan^{-1}\left(\frac{5}{7}\right)$$

$$\text{ii) } i, \tan^{-1}\left(\frac{\sqrt{2}}{\sqrt{3}}\right)$$

$$\text{iii) } 17, -\tan^{-1}\left(\frac{15}{8}\right) \quad \text{iv) } 3\sqrt{2}, \frac{3\pi}{4}$$

$$\text{v) } 4\sqrt{2}, \frac{\pi}{4} \quad \text{vi) } \frac{11\pi}{6}$$

$$\text{vii) } 3, 0 \quad \text{viii) } \sqrt{2}, \frac{\pi}{4}$$

$$\text{ix) } 2, \frac{\pi}{3} \quad \text{x) } 5\sqrt{2}, \tan^{-1} 7$$

$$\text{Q.2 } \theta = n\pi, n \in \mathbb{Z}$$

$$\text{Q.4 i) } 2 \left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3} \right); 2e^{\frac{2\pi}{3}i}$$

$$\text{ii) } 1 \left(\cos \frac{3\pi}{2} + i \sin \frac{3\pi}{2} \right); e^{\frac{3\pi}{2}i}$$

$$\text{iii) } 1 (\cos \pi + i \sin \pi); e^{\pi i}$$

$$\text{iv) } \frac{1}{\sqrt{2}} \left(\cos \frac{7\pi}{4} + i \sin \frac{7\pi}{4} \right); \frac{1}{\sqrt{2}} e^{\frac{7\pi}{4}i}$$

$$\text{v) } \frac{1}{\sqrt{2}} \left(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4} \right); \frac{1}{\sqrt{2}} e^{\frac{3\pi}{4}i}$$

$$\text{vi) } \sqrt{2} \left(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4} \right); \sqrt{2} e^{\frac{3\pi}{4}i}$$

$$\text{Q.5 i) } \frac{3}{2} + \frac{\sqrt{3}i}{2} \quad \text{ii) } (1-i)$$

$$\text{iii) } \frac{-7\sqrt{3}}{2} - \frac{7i}{2} \quad \text{iv) } \frac{1+\sqrt{3}i}{2}$$

$$\text{v) } \frac{-1+i\sqrt{3}}{2} \quad \text{vi) } \frac{-\sqrt{3}+i}{2}$$

$$\text{Q.6 } \frac{1}{\sqrt{2}}, \frac{3\pi}{4}$$

$$\text{Q.7 } \sqrt{2} (\cos \theta + i \sin \theta) \text{ where}$$

$$\tan \theta = \frac{\sqrt{3}+1}{\sqrt{3}-1}$$

EXERCISE 1.4

$$\text{Q.1 i) } 1 \quad \text{ii) } 1$$

$$\text{iii) } 1 \quad \text{iv) } 1$$

$$\text{Q.3 i) } -1 \quad \text{ii) } 0$$

$$\text{iii) } -1 \quad \text{iv) } 0$$

$$\text{v) } 1$$

$$\text{Q.6 i) } x^2 + y^2 = 100 \quad \text{ii) } (x-3)^2 + y^2 = 4$$

$$\text{iii) } (x-5)^2 + (y+6)^2 = 25$$

$$\text{iv) } x+2=0 \quad \text{v) } y=-x$$

$$\text{vi) } 2y-3=0$$

$$\text{Q.7 i) } \cos 2\theta + i \sin 2\theta \quad \text{ii) } \cos 11\theta + i \sin 11\theta$$

$$\text{iii) } 1$$

- Q.8 i) $-4+4i$ ii) $-8i$
 iii) $-8+8\sqrt{3}i$ iv) $512\sqrt{3}+512i$

MISECLLANEOUS EXERCISE - 1

(I)

Q. No.	1	2	3	4	5
Ans	B	D	A	C	B

Q. No.	7	8	9	10
Ans	B	A	D	D

(II) 1)

- 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) $\frac{1}{4}+\frac{\sqrt{15}}{4}i$
 ix) $-i$ x) $\frac{40}{25}+\frac{56}{25}i$
- 2) i) $x=2, y=1$ ii) $x=17, y=19$
 iii) $x=\frac{28}{61}, y=\frac{3}{61}$ iv) $x=4, y=-2$
- 3) i) $-i$ ii) 0
- 4) i) 1 ii) 0
- 5) i) $\pm(3+5i)$ ii) $\pm(4-i)$
 iii) $\pm(\sqrt{3}+i)$ iv) $\pm(3+3i)$
 v) $\pm(2-i)$ vi) $\pm\sqrt{2}(2+i)$

6) i) $17, \tan^{-1}\left(\frac{15}{8}\right),$

$17(\cos\theta+i\sin\theta)$ where $\tan\theta=\frac{15}{8}$

ii) $\sqrt{37}, \theta=\tan^{-1}\left(\frac{-1}{6}\right),$

$\sqrt{37}(\cos\theta+i\sin\theta)$ where $\tan\theta=\frac{-1}{6}$

iii) $1, \frac{\pi}{3}, 1\left(\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}\right)$

iv) $1, 5\frac{\pi}{4}, 1\left(\cos 5\frac{\pi}{4}+i\sin\left(5\frac{\pi}{4}\right)\right)$

v) $2, \frac{\pi}{2}, 2\left(\cos\frac{\pi}{2}+i\sin\frac{\pi}{2}\right)$

vi) $3, \frac{3\pi}{2}, 3\left(\cos\frac{3\pi}{2}+i\sin\frac{3\pi}{2}\right)$

vii) $1, \frac{\pi}{4}, 1\left(\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}\right)$

9) $x=1, y=2$

12) i) $2\left(\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}\right); 2e^{\frac{\pi}{3}i}$

ii) $\sqrt{38}(\cos\theta+i\sin\theta)$ where $\tan\theta=\frac{-\sqrt{2}}{6};$
 $\sqrt{38}e^{i\theta}$

iii) $3(\cos\theta+i\sin\theta)$ where $\tan\theta=-\sqrt{3};$
 $3e^{i\theta}$

16) i) $-i$ ii) 0 iii) -1

17) $\frac{1}{4}+\frac{9}{4}i$

20) 2

2. SEQUENCES AND SERIES

EXERCISE 2.1

1) i), ii) and iii) are G.Ps iv) and v) not G.Ps.

i) $2(3)^{n-1}$ ii) $(-5)^{n-1}$ iii) $\sqrt{5}\left(\frac{1}{5}\right)^{n-1}$

2) i) $t_7 = \frac{1}{81}$ ii) $t_6 = 7$ iii) $a = -7$ iv) $r = 3$

3) $t_{10} = 5^{10}$ 4) $x = \pm \frac{4}{9}$ 5) $t_1 = \frac{4}{25}, r = \frac{5}{2}$

6) 3, 6, 12 or 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

11) 800 12) $80\left(\frac{3}{4}\right)^6$ ft, $80\left(\frac{3}{4}\right)^n$ ft

13) i) 6, -3 ii) $3(2)^{19}; -3$ iii) $3(2)^{n-1}; 3(-1)^{n-1}$

14) i) $200(1.1)^3$ ii) $200(1.1)^{10}$ iii) $200(1.1)^n$

15) i) 10 ii) 4 iii) $4(5)^{n-1}$

5) i) $\frac{3}{81}[10(10^n - 1) - 9n]$

ii) $\frac{8}{81}[10(10^n - 1) - 9n]$

6) i) $\frac{4}{81}\left[9n - \left(1 - \frac{1}{10^n}\right)\right]$

ii) $\frac{7}{81}\left[9n - \left(1 - \frac{1}{10^n}\right)\right]$

7) i) $\frac{5}{9}\left[1 - \left(\frac{1}{10}\right)^n\right]$

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

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

11) i) 6138

ii) $\frac{15}{2}[3^{10} - 1]$

12) 20.1 Lac

15) 10 years

EXERCISE 2.2

1) i) $3(2^n - 1)$ ii) $\frac{p^2}{p-q}\left[1 - \left(\frac{q}{p}\right)^n\right]$ if $q < p$

and $\frac{p^2}{q-p}\left[\left(\frac{q}{p}\right)^n - 1\right]$ if $q > p$

iii) $\frac{7}{9}\left[1 - \frac{1}{10^n}\right]$ iv) $\frac{-\sqrt{5}}{(\sqrt{5}+1)}[(-\sqrt{5})^n - 1]$

2) i) $\frac{266}{243}$ ii) 3 3) i) 5 ii) $\frac{3}{5}$

4) i) 635 ii) 2046

1) i) 1 ii) 6

iii) $-\frac{9}{4}$ iv) does not exist v) 90

2) i) $\frac{7}{9}$ ii) $\frac{22}{9}$ iii) $\frac{106}{45}$ iv) $\frac{2296}{45}$

3) 4 4) $-\frac{11}{6}$ 5) $\frac{15}{4}, \frac{15}{16}, \frac{15}{64}, \dots$

6) i) 4 ii) $-\frac{1}{4}$ iii) $\frac{8}{3}$ iv) $\frac{2}{3}$

7) i) 2 ii) $\frac{4\sqrt{2}}{\sqrt{2}-1}$ 8) 25 m

EXERCISE 2.3

EXERCISE 2.4

1) (i) and (iii) are H.P. ; (ii) is not 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) 5 4) $\frac{24}{5}$ 5) 60 6) $\frac{3}{11}, \frac{3}{10}$

7) -3, 9 8) 4, 16 9) 4, 9

EXERCISE 2.5

1) i) $\frac{2(1-nx^n)}{1-x} + \frac{2x(1-x^{n-1})}{(1-x)^2}$

ii) $\frac{1-(3n-2)x^n}{1-x} + \frac{3x(1-x^{n-1})}{(1-x)^2}$

iii) $\frac{n(3^n)-1}{2} + \frac{3-3^n}{4}$ iv) $3[(n-1)2^n+1]$

2) i) $\frac{16}{9}$ ii) $\frac{75}{16}$ iii) $\frac{3}{16}$

EXERCISE 2.6

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

3) $\frac{n(n+3)}{4}$ 4) $\frac{n(n+1)(n+2)}{12}$

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

6) $\frac{2n(n+1)(2n+1)}{3}$ 7) 2485

8) $n^2(n+1)^2 + \frac{8.n(n+1)(2n+1)}{6} + \frac{3.n(n+1)}{2}$

9) 48

MISCELLANEOUS EXERCISE - 2

(I)

1	2	3	4	5	6	7	8	9	10
D	C	A	C	A	C	C	A	D	C

II)

1) 3072 2) $\frac{211}{81}$ 3) $\frac{3}{4}$

4) $a = \frac{49}{5}; r = \frac{5}{7}$ 5) 5,10,20 or 20,10,5

6) $\frac{1}{3}, 1, 3, 9, 27$ or $27, 9, 3, 1, \frac{1}{3}$

8) $\frac{2}{81}[10(10^n-1)-9n]$

9) $\frac{2}{3}\left(1-\frac{1}{10^n}\right)$ 10) $\frac{n}{6}(10n^2+27n-1)$

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) $6\left[\frac{n(n+1)(2n+1)}{6} + \frac{n(n+1)}{2}\right]$

15) $2n(n+1)(n+3)(n+4)$

16) $\frac{n(4n^2+15n+17)}{36}$

17) 2364

18) 9

19) 1275

20) 5

21) $\frac{7}{15}$

22) $\frac{1}{3}$

23) $2\left[1-\left(\frac{2}{3}\right)^n\right]$

24) 2 25) $2187\left[1-\left(\frac{2}{3}\right)^8\right]$

26) 1

27) 10, 20 (28) A.P. 32) $\frac{4}{45}$ 33) $\frac{35}{16}$

3. PERMUTATIONS AND COMBINATIONS

EXERCISE 3.1

- 1) 50 ways
- 2) 12
- 3) i) 25 ii) 20
- 4) i) 100 ii) 48
- 5) 125
- 6) 124
- 7) 31
- 8) 90
- 9) 225
- 10) 24
- 11) 276
- 12) 207
- 13) 12
- 14) 216

- | | |
|-----------------------------------|----------------------------------|
| 4) i) 28 | ii) 1 |
| iii) 3003 | iv) 6435 |
| 5) i) 1848 | ii) 43/14 |
| iii) 5 | iv) 6 |
| v) 8 | |
| 6) i) 11 | ii) 11 |
| iii) 7 | iv) 8 |
| v) 5 | |
| 10) i) $(2n + 1)(2n + 2)$ | ii) $\frac{n + 3}{n - 2}$ |
| iii) $\frac{-(n + 1)}{n(n - 2)!}$ | iv) $(3n + 2)n!$ |
| v) $\frac{n^2 + 1}{(n + 1)!}$ | vi) $\frac{(n^2 + 1)}{(n + 1)!}$ |
| vii) 0 | viii) $\frac{1}{(n + 2)!}$ |

EXERCISE 3.3

EXERCISE 3.2

- 1) i) 40320 ii) 3628800
- iii) 3628080 iv) 24
- 2) i) 665280 ii) 2
- iii) 720 iv) 12
- v) 84 vi) 29
- vii) 57.93 viii) 20160
- 3) i) $\frac{10!}{4!}$ ii) $3^5 \times 5!$
- iii) $\frac{9!}{5!}$ iv) $5^4 \times 4!$

- 1) $n = 9$
- 2) $m = 6, n = 2$
- 3) $r = 6$
- 5) a) 2401 b) 840
- 6) a) 30240 b) 151200
- c) 43200 d) 5040
- 7) $\frac{12! \times 13!}{7}$
- 8) a) 1440 b) 720
- c) 7! d) 240
- e) 120 f) 120

- 9) 144
 10) a) 1296 b) 360
 11) 100
 12) 720 a) 120, b) 600
 13) 46800, 20800
 14) 243
 15) i) 2880 ii) 5040
 16) i) 120 ii) 48 iii) 72
 17) i) 720 ii) 144 iii) 288 iv) 144

EXERCISE 3.4

- 1) i) 120 ii) 60480
 iii) 30240 iv) 5040
 v) 302400
 2) 1260
 3) a) 70 b) 37
 4) $\frac{13!}{5!4!4!}$
 5) $\frac{12!}{2!3!2!}$
 6) $\frac{11!}{4!2!2!}$ a) 405720 b) $\frac{8!}{2!2!}$
 7) 210 8) 60
 9) $\frac{10!}{2!3!2!}$ 10) 1260, 1230
 11) 180 12) 144
 13) 36, 84 14) 180, 60
 15) a) 1800 b) 72

EXERCISE 3.5

- 1) $7! = 5040$ 2) $20!, 2 \cdot 18!$
 3) a) $2 \cdot 23!$ b) $21 \cdot 22!$

- 4) $\frac{14!}{2}$
 5) $2 \cdot 8!$
 6) a) $5! \times 2! = 240$ b) 2400
 7) $7! \times 8P_6$ 8) 144
 9) $\frac{9!}{4!}$ 10) $12 \cdot 13!$

EXERCISE 3.6

- 1) a) 1365 b) 3160 c) ${}^{16}C_5$ d) ${}^{19}C_{15}$
 2) a) $n = 2$ b) $n = 7$
 c) $n = 9$
 3) $r = 4$
 4) a) $n = 10, r = 3$ b) $n = 10, r = 4$
 5) $r = 8$ 6) 126
 7) 39200 8) 120
 9) 12 10) 190
 11) ${}^nC_2 - n$; a) 35 b) 90 c) 54 d) 20
 12) 190
 13) a) 45 b) 40
 14) a) 220 b) 216
 15) 151200
 16) i) $n = 20$ ii) $n = 4, 3$
 iii) $n = 1, 2$ iv) $n = r$
 v) $n = 6$
 17) $x = r!$ 18) $r = 7$
 19) 14161
 20) a) 2508 b) 1646 c) 5973
 21) 16 22) 2275
 23) 36873 ; 6885 24) 425
 25) 51051
 26) a) 84 b) 126

MISCELLANEOUS EXERCISE - 3

1	2	3	4	5	6	7	8	9	10
C	A	B	D	C	B	D	B	C	D

1) 45	2) 120
3) 720 ; AINMRE	4) 990
5) 360	6) 5541965

18) i) 66 ii) 11 iii) 220 iv) 55

16) 896

4.METHOD OF INDUCTION AND BINOMIAL THEOREM

EXERCISE 4.1

$$\begin{aligned} 9) \quad p(n) &= \frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \dots + \frac{1}{(2n+1)(2n+3)} \\ &= \frac{n}{3(2n+3)} \end{aligned}$$

EXERCISE 4.2

5) i) 108243216 ii) 1.61051

v) 10500000

iv) 84

- 4) i) 924 ii) $35x^5, 35x^2$
 iii) $1120x^4$ iv) -252
 v) $-462x^9$ and $462x^2$
- 5) $k = 5$
- 6) 91854
- 7) $m = 8$

EXERCISE 4.4

- 1) i) $1 - 4x + 10x^2 - 20x^3 + \dots$
 ii) $1 - \frac{x}{3} - \frac{x^2}{9} - \frac{5x^3}{81} - \dots$
 iii) $1 + 3x^2 + 6x^4 + 10x^6 + \dots$
 iv) $1 - \frac{x}{5} + \frac{3x^2}{25} - \frac{11x^3}{125} + \dots$
 v) $1 - x^2 + x^4 - x^6 + \dots$
- 2) i) $a^{-3} \left[1 + \frac{3b}{a} + \frac{6b^2}{a^2} + \frac{10b^3}{a^3} + \dots \right]$
 ii) $a^{-4} \left[1 - \frac{4b}{a} + \frac{10b^2}{a^2} - \frac{20b^3}{a^3} + \dots \right]$
 iii) $a^{\frac{1}{4}} \left[1 + \frac{b}{4a} - \frac{3b^2}{32a^2} + \frac{7b^3}{128a^3} + \dots \right]$
 iv) $a^{-\frac{1}{4}} \left[1 + \frac{b}{4a} + \frac{5b^2}{32a^2} + \frac{15b^3}{128a^3} + \dots \right]$
 v) $a^{\frac{1}{3}} \left[1 - \frac{b}{3a} + \frac{2b^2}{9a^2} - \frac{14b^3}{81a^3} + \dots \right]$
- 3) i) $1 - 8x + 40x^2 + \dots$
 ii) $1 - \frac{3x}{2} + \frac{27x^2}{8} + \dots$
 iii) $2^{\frac{1}{3}} \left(1 - \frac{x}{2} - \frac{x^2}{4} \dots \right)$

$$\text{iv) } 5^{-\frac{1}{2}} \left(1 - \frac{2x}{5} + \frac{6x^2}{25} + \dots \right)$$

$$\text{v) } 5^{\frac{1}{3}} \left(1 + \frac{x}{5} + \frac{2x^2}{25} + \dots \right)$$

- 4) i) 9.9499 ii) 5.0133
 iii) 2.0025 iv) 0.9057
 v) 1.0625

MISCELLANEOUS EXERCISE - 4

(I)

1	2	3	4	5	6	7	8	9	10
B	C	C	A	A	D	D	D	B	D

(II)

- 4) $243x^{10} + 810x^8y + 1080x^6y^2 + 720x^4y^3 + 240x^2y^4 + 32y^5$
- 5) $\frac{16x^4}{81} - \frac{16x^2}{9} + 6 - \frac{9}{x^2} + \frac{81}{16x^4}$
- 6) $\frac{27}{2}x^4y^6$ 7) $\frac{1760}{x^3}$
- 8) i) -20 ii) $\frac{-63x^5}{8y^5}$
- iii) $280x^8y^6$ and $560x^6y^8$
- iv) $\frac{189}{16}x^6$ and $-\frac{21}{8}x^3$
- 9) i) 378 ii) 153
- 10) i) 2268 ii) 7920
- 12) ± 2 13) 2
- 14) $\frac{9}{7}$ 15) 2
- 18) $1 + \frac{x}{3} + \frac{x^2}{6} + \frac{5x^3}{54} + \dots$
- 19) $1 + \frac{x}{4} + \frac{5x^2}{32} + \frac{15x^3}{128} + \dots$

$$20) 5^{-\frac{1}{2}} \left[1 - \frac{2x}{5} + \frac{6x^2}{25} - \dots \right]$$

$$21) 9.9833$$

$$22) 0.2451$$

$$23) -80$$

$$24) a = 3, b = -2, c = 57$$

$$25) n = 9$$

$$26) n = 6; k = -2$$

5. SETS AND RELATIONS

EXERCISE 5.1

$$1) \text{ i) } A = \{M, O, V, E, N, T\}$$

$$\text{ii) } B = \{-1, 0, 1, 2, 3, 4\}$$

$$\text{iii) } C = \{3, 5, 7, \dots\}$$

$$2) \text{ i) } \{x \mid x \in W, x \notin N\}$$

$$\text{ii) } \{x \mid -3 \leq x \leq 3, x \in Z\}$$

$$\text{iii) } \{x \mid x = \frac{n}{n^2 + 1}, n \in N \text{ and } n \leq 7\}$$

$$\text{iv) } \{x \mid x = (-1)^{n-1} \times (n-1), n \in N\}$$

$$3) A \cup B \cup C = \left\{ \frac{-5}{3}, -1, \frac{-1}{2}, \frac{3}{2}, 3 \right\}$$

$$4) A \cap B \cap C = \{ \}$$

$$6) \text{ i) } 45 \quad \text{ii) } 10 \quad \text{iii) } 10 \quad \text{iv) } 25$$

$$7) \text{ i) } 132 \quad \text{ii) } 63$$

$$8) \text{ i) } 1750 \quad \text{ii) } 250 \quad \text{iii) } 1100$$

$$9) 42$$

$$10) \text{ i) } 114 \quad \text{ii) } 38 \quad \text{iii) } 188$$

$$11) P(A) = \{\emptyset, \{1\}, \{2\}, \{3\}, \{1,2\}, \{2,3\}, \{1,3\}, \{1,2,3\}\}$$

$$12) \text{ i) } \{x \mid x \in R, -3 < x < 0\}$$

$$\text{ii) } \{x \mid x \in R, 6 \leq x \leq 12\}$$

$$\text{iii) } \{x \mid x \in R, x > 6\}$$

$$\text{iv) } \{x \mid x \in R, x < 5\}$$

$$\text{iv) } \{x \mid x \in R, 2 < x \leq 5\}$$

$$\text{iv) } \{x \mid x \in R, -3 \leq x < 4\}$$

$$13) 9$$

$$14) \text{ i) } (-8, 6]$$

$$\text{ii) } (-\infty, -4) \cup (5, \infty)$$

$$\text{iii) } (-\infty, 4) \cup \left[\frac{20}{3}, \infty \right) \quad \text{iv) } \left[\frac{1}{3}, \frac{1}{2} \right]$$

$$15) \text{ i) } (-7, 6]$$

$$\text{ii) } [2, 9]$$

$$\text{iii) } (-7, 3] \cup [4, 9] \quad \text{iv) } [2, 3]$$

$$\text{v) } [4, 6]$$

$$\text{vi) } \{ \}$$

$$\text{vii) } (3, 6]$$

$$\text{viii) } (-\infty, 2) \cup (9, \infty)$$

$$\text{ix) } [2, 4)$$

$$\text{iv) } (-7, 2)$$

EXERCISE 5.2

$$1) x = 2, y = -2$$

$$2) x = \frac{1}{6}, y = \frac{15}{2}$$

$$3) A \times B = \{(a,x), (b,x), (c,x), (a,y), (b,y), (c,y)\}$$

$$B \times A = \{(x,a), (x,b), (x,c), (y,a), (y,b), (y,c)\}$$

$$A \times A = \{(a,a), (a,b), (a,c), (b,a), (b,b), (b,c), (c,a), (c,b), (c,c)\}$$

$$B \times B = \{(x,x), (x,y), (y,x), (y,y)\}$$

$$4) P \times Q = \{(1,1), (1,4), (2,1), (2,4), (3,1), (3,4)\}$$

$$Q \times P = \{(1,1), (1,2), (1,3), (4,1), (4,2), (4,3)\}$$

$$6) \{(0,10), (6,8), (8,6), (10,0)\}$$

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

Domain $R_1 = \{2,3,5,7,11,13\}$

Range $R_1 = \{4,9,25,49,121,169\}$

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

Domain $R_2 = \{1,2,3,4,5\}$

Range $R_2 = \{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}\}$

iii) $R_3 = \{(1,3), (2,6), (3,9)\}$

Domain $R_3 = \{1,2,3\}$

Range $R_3 = \{3,6,9\}$

iv) $R_4 = \{(1,4), (1,6), (2,4), (2,6)\}$

Domain $R_4 = \{1,2\}$

Range $R_4 = \{4,6\}$

v) $R_5 = \{(0,3), (1,2), (2,1), (3,0)\}$

Domain $R_5 = \{0,1,2,3\}$

Range $R_5 = \{3,2,1,0\}$

vi) $R_6 = \{(1,4), (2,4), (3,4), (4,4), (5,4)\}$

Domain $R_6 = \{1,2,3,4,5\}$

Range $R_6 = \{4\}$

vii) $R_7 = \{(1,5), (2,4), (3,3), (4,2), (5,1)\}$

Domain $R_7 = \{1,2,3,4,5\}$

Range $R_7 = \{5,4,3,2,1\}$

viii) $R_8 = \{(1,3), (2,4), (3,5), (4,6)\}$

Domain $R_8 = \{1,2,3,4\}$

Range $R_8 = \{3,4,5,6\}$

MISCELLANEOUS EXERCISE - 5

I)

1	2	3	4	5	6	7	8	9	10
C	D	D	C	A	D	C	D	D	D

II)

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

ii) $B = \{x / x \text{ is the vowel of English alphabet}\}$

iii) $C = \{x / x \text{ is a day of a week}\}$

2) i) $\{1,2,4,6,7,9,11\}$ ii) $\{ \}$

iii) $\{1,10\}$ iv) $\{2,4,6,7,11\}$

v) $\{1,2,3,4,5,6,7,8,9,10,11,12\}$

vi) $\{4,7\}$

3) 230 4) 12

5) i) $A \times A = \left\{ (1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3) \right\}$

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

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

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

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

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

6) i) Yes; $D = \{1\}$, $R = \{4,5,6\}$

ii) Yes; $D = \{1,2,3\}$, $R = \{4,5,6\}$

iii) Yes; $D = \{1,2,3\}$, $R = \{4,5,6\}$

iv) No.

7) i) $D = \{1,2,3,4\}$, $R = \{4\}$

ii) $D = \{-2, -1, 0, 1, 2\}$, $R = \{0, 1, 2, 3\}$

8) i) $\{ \}$ ii) $A \times A$

9) reflexive, not symmetric and not transitive.

10) Yes

6. FUNCTION

EXERCISE 6.1

- 1) a) Yes b) No
c) No

- 2) a) No b) Yes
c) No d) Yes

- 3) a) Yes b) No
c) Yes d) Yes
e) No

- 4) a) 1 b) 19 c) $-\frac{1}{4}$ d) $x^2 - x - 1$
e) $x^2 + 3x + 1$ f) $h + 1$

- 5) a) $\frac{6}{5}$ b) ± 3 c) $\frac{1}{2}, -\frac{2}{3}$ d) 1, -2, 3

- 6) a) 0, ± 3 b) $\frac{17 \pm \sqrt{33}}{2}$

- 7) 1) $a = -2, b = 2$

- 8) a) $R; \left[-\frac{11}{7}, \infty\right)$ b) $R - \{2\}; R - \{1\}$
c) $(-5, \infty); R^+$ d) $R; R$ e) $[2, 5]; [0, \frac{3}{2}]$
f) $[3, 7]; [0, \infty]$ g) $[-4, 4]; [0, 4]$

- 9) a) $A = s^2$ b) $A = \frac{p^2}{16}$

- 10) a) $A = \pi r^2$ b) $A = \frac{\pi d^2}{4}$ c) $A = \frac{c^2}{4\pi}$

- 11) $x(30 - 2x)^2; (0, 15)$

- 12) Not a function; $f(0)$ has 2 values.

- 13) a) Injective but not surjective
b) neither injective nor surjective
c) neither injective nor surjective
d) injective but not surjective

- e) injective and surjective

16) $\frac{3}{16}$

17) a) $5 = \log_2 32$

b) $0 = \log_{54} 1$

c) $1 = \log_{23} 23$

d) $\frac{3}{2} = \log_9 27$

e) $-4 = \log_3 \left(\frac{1}{81}\right)$

f) $-2 = \log_{10} 0.01$

g) $\ln 7.3890 = 2$

h) $\ln 1.6487 = \frac{1}{2}$

i) $\ln 6 = -x$

18) a) $2^6 = 64$ b) $\frac{1}{25} = 5^{-2}$ c) $0.001 = 10^{-3}$

d) $8 = \left(\frac{1}{2}\right)^{-3}$ e) $e^0 = 1$ f) $e^1 = e$ g) $\frac{1}{2} = e^{-0.693}$

19) a) $(5, \infty)$

b) $(-\infty, 2) \cup (3, \infty)$

20) a) $\log p + \log q - \log r - \log s$

b) $\frac{1}{2} \log x + \frac{1}{3} \log y$

c) $3 \ln a + 2 \ln(a - 2) - \frac{1}{2} \ln(b^2 + 5)$

d) $2 \left[\frac{1}{3} \ln(x - 2) + 4 \ln(2x + 1) - \ln(x + 4) - \frac{1}{2} \ln(2x + 4) \right]$

21) a) $\log \left(\frac{x^5 y^7}{z} \right)$ b) $\log(\sqrt[3]{x-1} \sqrt{x})$

c) $\ln \left[\frac{x^2 - 4}{(x + 5)^3} \right]$

22) $\frac{5a + b}{2}$

24) $a = \frac{15}{4}, b = 9$

25) a) 3 b) 11,

c) 8

d) 1

EXERCISE 6.2

- 1) a) $9x + 4$ b) 0 c) 238
d) $\frac{3x+5}{6x-1}; R - \left\{\frac{1}{6}\right\}$
- 2) $\{(2,4), (4,2), (5,4)\}$
- 3) a) $50x^2 - 40x + 11$ b) $10x^2 + 13$
c) $8x^4 + 24x^2 + 21$
d) $25x - 12$
- 5) a) f^{-1} does not exist
b) f^{-1} doesn't exist
c) $f^{-1}(x) = \frac{3x+7}{6}$
d) f^{-1} does not exist
e) $f^{-1} = \sqrt[3]{\frac{x-8}{9}}$
f) f^{-1} does not exist
- 6) a) 22 b) 7 c) 3
- 7) a) -18 b) -14 c) 5 d) 25
- 8) a) 10 b) -5
- 9) a) 25 b) -3 c) -15 d) 21
- 10) a) -5 b) 1.75 c) -4.4 d) -30
- 11) a) $(-\infty, -9], [1, \infty)$ b) $1.5, 4.5$
c) $\{ \}$ d) $[-3, 3]$
f) $3 + r; 0 \leq r < 1$ g) $\{ \}$
h) N, Z i) $n + 0.5, n \in Z$
j) $x = 0$

MISCELLANEOUS EXERCISE - 6

(I)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

B	B	B	C	C	A	A	B	C	B
---	---	---	---	---	---	---	---	---	---

(II)

- 1) i) Function ; $\{2,4,6,8,10,12,14\}; \{1,2,3,4,5,6,7\}$
ii) Not a function
iii) Function ; $\{2,3,5\}; \{1,2\}$
- 2) i) not one one ii) one one
- 3) i) not onto ii) not onto
- 4) $f^{-1}(x) = \left(\frac{x+8}{5}\right)^{\frac{1}{3}}$
- 5) $f^{-1}(x) = \frac{5(x-2)}{3}$
- 6) 1, -3, does not exist
- 7) i) 2 ii) 0
- 8) $3x^4 - 12x^3 + 13x^2 - 2x + 5$
- 9) $a = 4, f(4) = 16$
- 10) $a = 3, b = -2$
- 11) i) $g \circ f = \{(1,6), (2,8), (3,10), (4,12)\}$
ii) $g \circ f = \{(1,1), (2,64), (3,64), (4,27)\}$
- 12) i) $f \circ g = x^2 - 16x + 69, g \circ f = x^2 - 3$
ii) $f \circ g = 3x^2 - 2, g \circ f = 9x^2 - 12x + 4$
iii) $f \circ g = 256x^2, g \circ f = 16x^2$
- 15) $f \neq g$
- 19) 8 22) $\log 4$
- 23) $\log_{10} 5$
- 26) $\frac{3}{2}, \frac{1}{2}$ 33) 2
- 34) 3 37) -8
- 39) a) $(-3,0) \cup (2,5)$ b) $\{-2,2,4\}$
c) $[-3,-2] \cup [2,3]$ d) $(-2,8)$
e) $\left[\frac{13}{5}, 7\right)$ f) $\left[\frac{9}{2}, 5\right)$

- g) $x = 0$ h) $x = 6k, k \in \mathbb{Z}$ e) $(1, \infty)$
- 40) a) $\mathbb{R} - \{2, -3\}$ 42) a) $\text{fog}(x) = x = \text{gof}(x)$
 b) $[3, 4) \cup (4, 5)$ b) $\text{fog}(x) = x = \text{gof}(x)$
 c) $[-1, 1]$ d) W 43) a) $f(x) = 2x - 3$ or $-2x + 2$
 e) $\{1, 2, 3\}$ f) $[0, 1]$ b) $f(x) = x^2 + 2$
 g) $(-\infty, 3 - \sqrt{3}) \cup (3 + \sqrt{3}, \infty)$ 44) a) $\frac{x}{\sqrt{1+2x^2}}$ b) x
- 41) a) $[0, \infty)$ b) $[-\frac{1}{6}, \frac{1}{6}]$
 c) $(0, 1]$ d) $(-1, 0]$

7. LIMITS

EXERCISE 7.1

- I) 1) $-\frac{1}{\sqrt{3}}$ 2) 15 3) $-\frac{1}{25}$
- II) 1) $\frac{2\sqrt{3}}{3}$ 2) $-\frac{3}{16}$ 3) $\frac{3}{125}$ 4) $\pm \frac{2}{\sqrt{3}}$
- III) 1) $\frac{n(n+1)}{2}$ 2) $\frac{2}{3\sqrt[3]{7}}$ 3) 4 4) 4
- 5) $-\frac{1}{6}$ 6) 24 7) $\frac{3\sqrt{a+2}}{2}$
- 8) $294\sqrt{7}$ 9) n^2

EXERCISE 7.2

- I) 1) $-\frac{1}{4}$ 2) $-\frac{1}{2}$ 3) $-\frac{1}{2}$ 4) $-\frac{1}{2}$ 5) 8
- II) 1) $\frac{4}{3}$ 2) 0 3) 0 4) $2x-2$ 5) -3
 6) Does not exist
- III) 1) 3 2) -2 3) $\frac{1}{2}$ 4) 0 5) $-\frac{3}{a^2}$

EXERCISE 7.3

- I) 1) $\frac{1}{2\sqrt{6}}$ 2) $-\frac{1}{18}$ 3) -1 4) $\sqrt{2}$

- II) 1) $\frac{2}{3\sqrt{3}}$ 2) -8 3) $\frac{1}{8\sqrt{3}}$ 4) $\frac{1}{2a}$ 5) $-\frac{2}{3}$
- III) 1) $\frac{7}{2}$ 2) 1 3) 24 4) $-\frac{1}{3}$ 5) $\frac{1}{18}$

EXERCISE 7.4

- I) 1) $\frac{m}{n}$ 2) 2 3) 2 4) $\frac{1}{2}$
- II) 1) $\frac{n^2}{m^2}$ 2) $-\frac{1}{4}$ 3) $\frac{1}{\sqrt{2}}$
- III) 1) $\frac{a^2-b^2}{c^2}$ 2) $-\frac{1}{4\sqrt{2}}$ 3) $2\sqrt{2}$ 4) -3

EXERCISE 7.5

- I) 1) $\frac{1}{2}$ 2) $5a^{\frac{4}{5}} \cdot \cos a$ 3) $\frac{1}{8}$
 4) $\frac{1}{3}$ 5) $\frac{2}{\pi}$
- II) 1) $-\frac{1}{2\sqrt{3}}$ 2) $\frac{1}{16\sqrt{2}}$ 3) $\frac{1}{36}$
 4) $\frac{\cos \sqrt{a}}{2\sqrt{a}}$ 5) $-\frac{1}{2}$

EXERCISE 7.6

- I) 1) $\frac{\log\left(\frac{9}{5}\right)}{\log 4}$ 2) $\log \frac{15}{2}$ 3) $\log(abc)$
 4) $\log\left(\frac{40}{9}\right)$ 5) $\log 2$.
- II) 1) $(\log 3)^2$ 2) $e^{\frac{2}{3}}$ 3) $e^{14/3}$ 4) $-\frac{2}{3}$
 5) e^8 6) $e^{\frac{2}{3}}$
- III) 1) $\frac{1}{2} \log \frac{a}{b}$ 2) $\frac{(\log 2)^3}{\log 3}$ 3) $\log 3 \cdot \log 5$
 4) $(\log 5)^2$ 5) $\frac{1}{2} \left[\log \left(\frac{7}{5} \right) \right]^2$

EXERCISE 7.8

- I) 1) $\frac{a}{e}$ 2) 1 3) $\frac{7}{8}$
- II) 1) 7 2) 2 3) 2
- III) 1) 15 2) $\frac{256}{81}$ 3) $\frac{1}{2}$ 4) $\left(\frac{3}{2}\right)^{30}$ 5) 4

MISCELLANEOUS EXERCISE - 7

I)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	B	A	D	C	C	C	C	A	D	B	D	C	B	B

II)

- 1) $\frac{5}{3}$ 2) Does not exist 3) $2\pi r$
 4) Does not exist 5) 3 6) 21 7) $\frac{1}{2}$ 8) 1
 9) $-\frac{1}{10} \log 2$ 10) $2(\log a)^2$ 11) $\cos a$ (12) $\frac{1}{2}$
 13) $\frac{ab}{2} \log \frac{b}{a}$ 14) $\frac{(\log 5)^2}{\log 2}$
 15) $\frac{(2)^2 (7)^3}{(5)^5} = \frac{1372}{3125}$ 16) $a \sin a + \cos a$
 17) $2\sqrt{2}$ 18) $(\log 2)^2$ 19) $(\log 2)^2$ 20) $\frac{1}{2}$
 21) Does not exist 22) $\frac{n(n+1)(4n-1)}{6}$
 23) $\frac{1}{256}$ 24) 2

8. CONTINUITY

EXERCISE 8.1

- 1) (i) Continuous at $x = -2$ (ii) Continuous at $x = \frac{\pi}{4}$ (iii) Discontinuous at $x = 3$
- 2) (i) Discontinuous. (ii) Continuous. (iii) Continuous
- 3) Discontinuous at $x = -2$, $x = -1$, $x = 0$, $x = 1$.
- 4) Continuous.
- 5) (i) Discontinuous. (ii) Continuous. (iii) Continuous (iv) Continuous (v) Discontinuous at $x = 2$
- 6) (i) Removable (ii) Jump (iii) Jump (iv) Removable
- 7) (i) Extension = 0 i.e. $f(0) = 0$ (ii) Extension = $7/2$, i.e. $f(0) = \frac{7}{2}$ (iii) Extension = $-2/3$, i.e. $f(-1) = -\frac{2}{3}$
- 8) (i) Discontinuous (ii) Discontinuous (iii) Continuous

- 9) (i) Removable, $f(0) = 3/2$
 (ii) Removable, $f(0) = 5/3$
 (iii) Removable, $f(0) = e^{-2}$
 (iv) Irremovable
 (v) Irremovable

- 10) (i) $-\frac{1}{4\sqrt{3}}$ (ii) $-\frac{4}{3}$ (iii) $4(\log 2)^2$
 11) (i) $\frac{3}{2}$ (ii) $(\log 5)^2$ (iii) $a = -18/5, b = 7$.
 (iv) $a = 2, b = -4$.
 (v) $a = 1/2$ and $b = 1/2$

12) Continuous

13) Continuous

[Clue : $(\sin x + \cos x)^3 = [(\sin x + \cos x)^2]^{3/2}$
 $= (1 + \sin 2x)^{3/2}$, Let $(1 + \sin 2x) = t$]

- 14) $p = -3$ and $q = 4$

MISCELLANEOUS EXERCISE - 8

(I)

1	2	3	4	5	6	7	8	9	10
A	D	D	B	A	B	A	B	C	C

- (II) (1) Continuous on its domain except at $x = 5$
 (2) Continuous on its domain except at $x = 5$

- (3) Discontinuous at $x = 0$
 (4) Continuous at $x = 1$
 (5) Discontinuous
 (6) Discontinuous at $x = -1, 0, 1$.
 (7) Continuous on $\mathbb{R}$, except at $x = 5$.

- (III) (1) Removable.
 (2) Jump
 (3) Continuous.

- (IV) (1) Removable

$$f(x) = \frac{(x+3)(x^2-6x+8)}{x^2-x-12}$$

$$= -5 \quad \text{for } x = -3$$

$$= 2 \quad \text{for } x = 4$$

- (2) Irremovable

- (V) (1) e^6 (2) 125

- (VI) (1) $a = 2, b = 4$

$$(2) a = -\frac{4}{5}, b = \frac{27}{5}$$

- (VII) (1) $f(1) = \frac{\pi}{2}$ (2) $f(\pi) = \frac{49}{10}$

- (VIII) (1) $f(1) < 0$ and $f(2) > 0$

$$(2) f(z) = 0; f(3) < 0 \text{ and } f(4) > 0$$

9. DIFFERENTIATION

EXERCISE 9.1

- 1) (a) $2x + 3$ b) $3 \cos(3x)$ c) $2e^{2x+1}$ d) $3^x \log 3$
 e) $\frac{2}{2x+5}$ f) $2 \sec^2(2x+3)$
 g) $5 \sec(5x-2) \tan(5x-2)$ h) $\frac{3\sqrt{x}}{2}$
 2) a) $\frac{1}{3}$ b) 2 c) $384 \log 2$ d) $\frac{2}{5}$
 e) $3e^2$ f) $\frac{1}{\sqrt{2}}$

- 5) i) Continuous and differentiable
 ii) Continuous and differentiable
 6) Neither continuous nor differentiable at $x = 2$
 7) Continuous but not differentiable
 8) Continuous but not differentiable
 9) Continuous and differentiable

EXERCISE 9.2

(I) (1) $\frac{4}{3}x^{\frac{1}{3}} + e^x - \cos x$

(2) $\frac{1}{2\sqrt{x}} + \sec^2 x - 3x^2$

(3) $\frac{1}{x} + \cos \operatorname{csc} x \cdot \cot x + 5^x \log 5 + \frac{9}{2x^{\frac{5}{2}}}$

(4) $\frac{7}{3}x^{\frac{4}{3}} + \frac{4}{x^{\frac{1}{5}}} + \frac{2}{x^{\frac{7}{5}}}$

(5) $7^x \log 7 + 7x^6 - \sqrt{x} - \frac{1}{x}$

(6) $-3 \cos \operatorname{csc}^2 x - 5e^x + \frac{3}{x} + \frac{3}{x^{\frac{7}{4}}}$

(II) (1) $x^4(x \sec^2 x + 5 \tan x)$

(2) $x^2(1 + 3 \log x)$

(3) $(x^2 + 2)[(x^2 + 2) \cos x + 4x \sin x]$

(4) $e^x \left(\frac{1}{x} + \log x \right)$

(5) $\sqrt{x}e^x[1 + x \log x + \frac{3}{2} \log x]$

(6) $3x^2(1 + 3 \log x)$

(III)

(1) $\frac{5}{2}x^{\frac{3}{2}} + x^3(1 + 4 \log x)$

(2) $e^x \sec x(\tan x + 1) - x^{\frac{2}{3}}(1 + \frac{5}{3} \log x)$

(3) $4x^3 - x^{\frac{3}{2}} \sin x + \frac{3}{2} \sqrt{x} \cos x - xe^x(x + 2)$

(4) $(x^3 - 2) \sec^2 x + 3x^2 \tan x + x \sin x - \cos x + x^6 \cdot 7^x(7 + x \log 7)$

(5) $\frac{\sin x}{x} + \cos x \log x + e^x(-\sin x + \cos x) - e^x \left(\frac{1 + 2x}{2\sqrt{x}} \right)$

(6) $e^x(\sec^2 x + \tan x) + \frac{\cos x}{x} - \sin x \log x - 5^x \left(\frac{2x \log 5 + 1}{2\sqrt{x}} \right)$

(IV) (1) $-\frac{16x}{(x^2 - 5)^2}$

(2) $-\frac{5}{\sqrt{x}(\sqrt{x} - 5)^2}$

(3) $\frac{e^x(x^2 + e^x)}{(x + e^x)^2}$

(4) $\frac{x + (\log x)^2}{(x + \log x)^2}$

(5) $\frac{x^2(1 + \sin x + x \cos x) + x \sin 2x}{(x + \cos x)^2}$

(6) $\frac{2e^x}{(3e^x - 2)^2}$

(V) (1) $f(x) = 5x^2 - 18x + 3$

(2) $f(x) = (\sqrt{3} + 1) \sin x + (\sqrt{3} - 1) \cos x$

MISCELLANEOUS EXERCISE - 9

I. (1) C (2) D (3) C (4) B

(5) B (6) D (7) A (8) C

II. (1) Differentiable

(2) $p = -3, q = 5$

(3) $p = 1/3, q = -4/3$

(4) $p = \pi/2, q = (2 - \pi)/2$

(5) Not Differentiable

(6) Not Differentiable

(7) Not Differentiable.

(8) Differentiable

(9) 2. Hint : Add and subtract $2f(2)$ in numerator.

(10) $\frac{e}{2}$

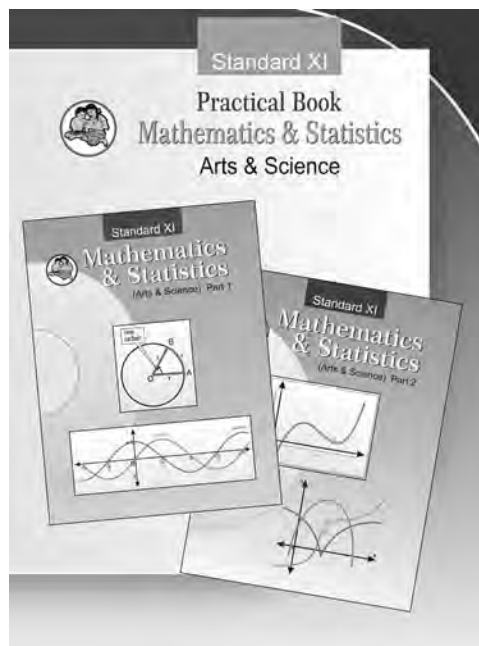


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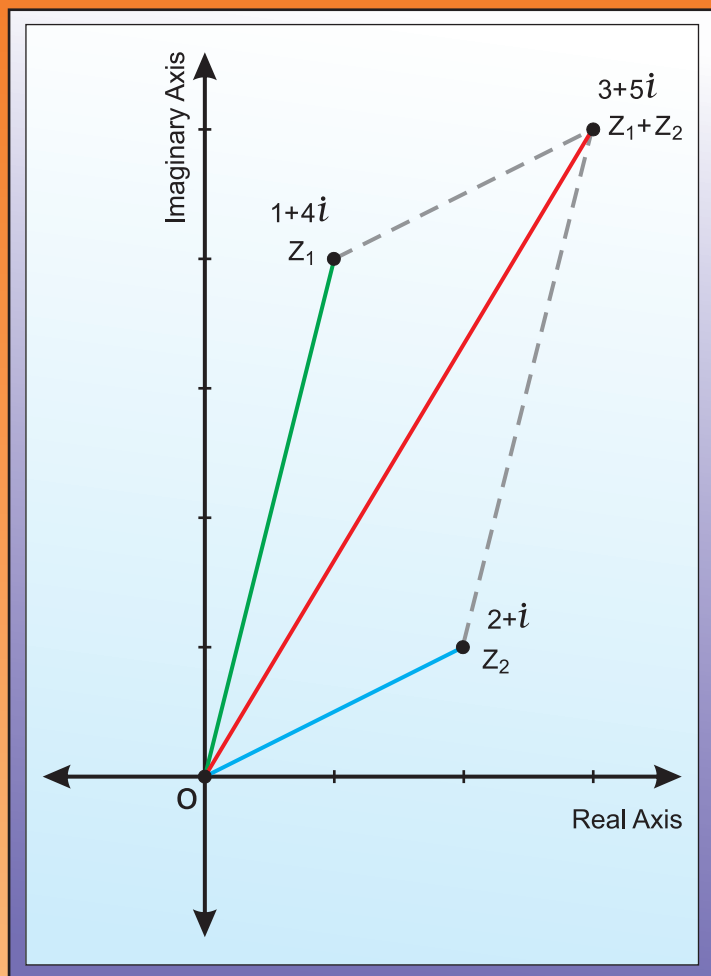


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