

ANSWERS

1.3 EXERCISE

1. $(b,b), (c,c), (a,c)$
2. $[-5,5]$
3. $4x^2 - 4x - 1$
4. $f^{-1}(x) = \frac{x-3}{2}$
5. $f^{-1}\{(b,a), (d,b), (a,c), (c,d)\}$
6. $f \circ f(x) = x^4 - 6x^3 - 10x^2 - 3x$
7. $2, -1$
8. (i) represents function which is surjective but not injective
(ii) does not represent function.
9. $f \circ g = 2, 5, 5, 2, 1, 5$
12. (i) f is not function (ii) g is function (iii) h is function (iv) k is not function
14. $\frac{1}{3}, 1$
17. Domain of $R = \{1, 2, 3, 4, \dots, 20\}$ and
Range of $R = \{1, 3, 5, 7, 9, \dots, 39\}$. R is neither reflexive, nor symmetric and nor transitive.
21. (i) f is one-one but not onto, (ii) g is neither one-one nor onto (iii) h is bijective, (iv) k is neither one-one nor onto.
22. (i) transitive (ii) symmetric (iii) reflexive, symmetric and transitive (iv) transitive.
23. $[(2,5)] = \{(1,4), (2,5), (3,6), (4,7), (5,8), (6,9)\}$

25. (i) $f \circ g(x) = 4x^2 - 6x - 1$

(ii) $g \circ f(x) = 2x^2 - 6x - 1$

(iii) $f \circ f(x) = x^4 - 6x^3 + 14x^2 - 15x + 5$

(iv) $g \circ g(x) = 4x - 9$

26. (ii) & (iv)

27. (i) 28. C

29. B

30. D

31. B 32. B

33. A

34. C

35. C 36. B

37. D

38. A

39. B 40. B

41. A

42. A

43. C 44. B

45. D

46. A

47. B 48. $R = \{3, 8, 6, 6, (9, 4), (12, 2)\}$

49. $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (2, 3), (3, 2), (3, 3), (3, 4), (4, 3), (4, 4), (5, 5)\}$

50. $g \circ f = \{(1, 3), (3, 1), (4, 3)\}$ and $f \circ g = \{(2, 5), (5, 2), (1, 5)\}$

51. $f \circ f \circ f(x) = \frac{x}{\sqrt{3x^2 - 1}}$

52. $f^{-1}(x) = 7 + (4 - x)^{\frac{1}{3}}$

53. False

54. False

55. False

56. False

57. True

58. False

59. False

60. True

61. False

62. False

2.3 EXERCISE

1. 0

2. -1

4. $-\frac{\pi}{12}$

5. $-\frac{\pi}{3}$

7. 0, -1

8. $\frac{14}{15}$

11. $\frac{-3}{4}, \frac{3}{4}$

13. $\tan^{-1} \frac{4}{3} - x$ 17. $-\frac{4}{4}$ 19. $\frac{a_n - a_1}{1 + a_1 a_n}$
20. C 21. D 22. B 23. D
24. A 25. A 26. B 27. C
28. A 29. B 30. A 31. D
32. D 33. B 34. A 35. C
36. A 37. A
38. $\frac{2\pi}{3}$ 39. $\frac{2\pi}{5}$ 40. $\sqrt{3}$ 41. ϕ
42. $\frac{\pi}{3}$ 43. $\frac{2\pi}{3}$ 44. 0 45. 1
46. $-2\pi, 2\pi$ 47. $xy > -1$ 48. $\pi - \cot^{-1} x$
49. False 50. False 51. True 52. True
53. True 54. False 55. True

3.3 EXERCISE

1. $28 \times 1, 1 \times 28, 4 \times 7, 7 \times 4, 14 \times 2, 2 \times 14$. If matrix has 13 elements then its order will be either 13×1 or 1×13 .
2. (i) 3×3 , (ii) 9, (iii) $a_{23} \quad x^2 - y, a_{31} \quad 0, a_{12} \quad 1$
3. (i) $\begin{pmatrix} 1 & 9 \\ 2 & 2 \\ 0 & 2 \end{pmatrix}$ (ii) $\begin{pmatrix} 1 & 4 \\ -1 & 2 \end{pmatrix}$
4. $\begin{matrix} e^x \sin x & e^x \sin 2x \\ e^{2x} \sin x & e^{2x} \sin 2x \\ e^{3x} \sin x & e^{3x} \sin 2x \end{matrix}$ 5. $a = 2, b = 2$ 6. Not possible
7. (i) $X + Y = \begin{bmatrix} 5 & 2 & -2 \\ 12 & 0 & 1 \end{bmatrix}$ (ii) $2X - 3Y = \begin{bmatrix} 0 & -1 & 1 \\ -11 & -10 & -18 \end{bmatrix}$

$$(iii) Z = \begin{bmatrix} -5 & -2 & 2 \\ -12 & 0 & -1 \end{bmatrix}$$

$$8. \quad x = 4$$

$$11. \quad A^{-1} = \begin{bmatrix} -1 & -2 & -3 \\ 7 & 1 & 5 \end{bmatrix}$$

$$13. \quad A = [-1 \ 2 \ 1]$$

$$15. \quad AB = \begin{bmatrix} 12 & 9 \\ 12 & 15 \end{bmatrix} \quad BA = \begin{bmatrix} 9 & 6 & 12 \\ 7 & 8 & 16 \\ 4 & 5 & 10 \end{bmatrix}$$

$$19. \quad X = \begin{bmatrix} -2 & 0 \\ -1 & -3 \end{bmatrix}, Y = \begin{bmatrix} 2 & 1 \\ 2 & 2 \end{bmatrix}$$

$$24. \quad A = [-4]$$

$$37. \quad (i) \frac{1}{22} \begin{bmatrix} 7 & -3 \\ 5 & 1 \end{bmatrix} \quad (ii) \text{ not possible}$$

$$38. \quad x = 2, y = 4 \text{ or } x = 4, y = 2, z = -6, w = 4$$

$$39. \quad \begin{bmatrix} -24 & -10 \\ -28 & -38 \end{bmatrix}$$

$$41. \quad a = 2, b = 4, c = 1, d = 3$$

$$43. \quad \begin{bmatrix} 18 & 8 \\ 16 & 18 \end{bmatrix}$$

$$45. \quad a = -2, b = 0, c = -3$$

$$10. \quad -2, -14$$

$$12. \quad A = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$$

$$18. \quad x = 1, y = 2$$

$$20. \quad \begin{bmatrix} k \\ 2k \end{bmatrix}, \begin{bmatrix} k & k \\ 2k & 2k \end{bmatrix} \text{ etc.}$$

where k is a real number

$$30. \quad \text{True when } AB = BA$$

$$40. \quad A^3 = \begin{bmatrix} 187 & -195 \\ -156 & 148 \end{bmatrix}$$

$$42. \quad \begin{bmatrix} 1 & -2 & -5 \\ 3 & 4 & 0 \end{bmatrix}$$

$$44. \quad \text{True for all real values of } \alpha$$

50. $x = \pm \frac{1}{\sqrt{2}}, y = \pm \frac{1}{\sqrt{6}}, z = \pm \frac{1}{\sqrt{3}}$

51. (i) $\begin{bmatrix} -7 & -9 & 10 \\ -12 & -15 & 17 \\ 1 & 1 & -1 \end{bmatrix}$ (ii) inverse does not exist (iii) $\begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$

52. $\begin{bmatrix} 2 & 2 & \frac{5}{2} \\ 2 & -1 & \frac{3}{2} \\ \frac{5}{2} & \frac{3}{2} & 2 \end{bmatrix} + \begin{bmatrix} 0 & 1 & \frac{-3}{2} \\ -1 & 0 & \frac{1}{2} \\ \frac{3}{2} & \frac{-1}{2} & 0 \end{bmatrix}$

53. A

54. D

55. B

56. D

57. D

58. D

59. A

60. B

61. C

62. D

63. A

64. A

65. D

66. D

67. A

68. Null matrix

69. Skew symmetric matrix

70. -1

71. 0

72. Rectangular matrix

73. Distributive

74. Symmetrix matrix

75. Symmetrix matrix

76. (i) B A (ii) kA (iii) k A -B

77. Skew Symmetric matrix

78. (i) Skew symmetric matrix

(ii) neither symmetric nor skew symmetric matrix

79. Symmetric matrix

80. $AB = BA$

81. does not exist

82. False

83. False

84. False

85. True

86. True

87. False

88. False

89. True

90. False

91. False

92. False

93. False

94. True

95. False

96. True

97. False

98. True

99. False

100. True

101. True

4.3 EXERCISE

1. $x^3 - x^2 + 2$
2. $a^2(a + x + y + z)$
3. $2x^3y^3z^3$
4. $3(x + y + z)(xy + yz + zx)$
5. $16(3x + 4)$
6. $(a + b + c)^3$
12. $\theta = n\pi$ or $n\pi + (-1)^n \left(\frac{\pi}{6} \right)$
13. $x = 0, -12$
18. $x = 0, y = -5, z = -3$
19. $x = 1, y = 1, z = 1$
20. $x = 2, y = -1, z = 4$
24. C
25. C
26. B
27. D
28. C
29. A
30. A
31. A
32. C
33. D
34. D
35. D
36. B
37. C
38. $27|A|$
39. $\frac{1}{|A|}$
40. Zero
41. $\frac{1}{2}$
42. $(A^{-1})^2$
43. 9
44. Value of the determinant
45. $x = 2, y = 7$
46. $(y - z)(z - x)(y - x + xyz)$
47. Zero
48. True
49. False
50. False
51. True
52. True
53. True
54. False
55. True
56. True
57. True
58. True

5.3 EXERCISE

1. Continuous at $x = 1$
2. Discontinuous
3. Discontinuous
4. Continuous
5. Discontinuous
6. Continuous
7. Continuous
8. Discontinuous
9. Continuous
10. Continuous
11. $k = \frac{7}{2}$
12. $k = \frac{1}{2}$
13. $k = -1$
14. $k = \pm 1$
16. $a = 1, b = -1$
17. Discontinuous at $x = -2$ and $x = \frac{-5}{2}$
18. Discontinuous at $x = 1, \frac{1}{2}$ and 2
20. Not differentiable at $x = 2$
21. Differentiable at $x = 0$
22. Not differentiable at $x = 2$
25. $-(\log 2) \cdot \sin 2x \cdot 2^{\cos^2 x}$

26. $\frac{8^x}{x^8} \left[\log 8 - \frac{8}{x} \right]$ 27. $\frac{1}{\sqrt{x^2 - a}}$ 28. $\frac{5}{x \log x^5 \log \log x^5}$
29. $\frac{\cos \sqrt{x}}{2\sqrt{x}} - \frac{\sin 2\sqrt{x}}{2\sqrt{x}}$ 30. $n \cdot 2ax - b \sin^{n-1} ax^2 - bx - c \cos ax^2 - bx - c$
31. $\frac{-1}{2\sqrt{x-1}} \sin \tan \sqrt{x-1} \sec^2 \sqrt{x-1}$
32. $2x \cos x^2 - 2x \sin 2x^2 - \sin 2x$ 33. $\frac{-1}{2\sqrt{x} x - 1}$
34. $\sin x^{\cos x} \frac{\cos^2 x}{\sin x} - \sin x \cdot \log \sin x$ 35. $\sin^{mx} x \cos^n x (-n \tan x + m \cot x)$
36. $x - 1 - x^2 + x^3 - 9x^2 - 34x - 29$
37. -1 38. $\frac{1}{2}$ 39. $\frac{1}{2}$ 40. -1
41. $\frac{-3}{\sqrt{1-x^2}}$ 42. $\frac{3a}{a^2 - x^2}$ 43. $\frac{-x}{\sqrt{1-x^4}}$ 44. $\frac{t^2 - 1}{t^2 - 1}$
45. $e^{-2\theta} \left(\frac{-\theta^3 + \theta^2 + \theta + 1}{\theta^3 + \theta^2 + \theta - 1} \right)$ 46. $\cot \theta$ 47. 1
48. t 51. $-\frac{1}{\sqrt{3}}$ 52. $\frac{\tan x - x}{\sin^2 x}$ 53. $\frac{1}{2}$
54. $\frac{2xy^2 - y^3 \cos xy - y}{xy^2 \cos xy - x y^2}$ 55. $\frac{y \sec x - y \tan x - y}{\sec x - y \tan x - y - x}$
56. $\frac{-x}{y}$ 57. $\frac{y - 4x^3 - 4xy^2}{4yx^2 + 4y^3 - x}$ 64. $-2 \sin y \cos^3 y$
70. Not applicable since f is not differentiable at $x = 1$

$$71. \quad , -2 \qquad 72. (2, -4) \qquad 77. \quad \frac{7}{2}, \frac{1}{4} \qquad 78. \quad \frac{3}{2}, 0$$

$$79. \quad p \geq 3, q \leq 5 \qquad 82. \quad x^{\tan x} \left(\sec^2 x \log x + \frac{\tan x}{x} \right) + \frac{x}{\sqrt{2} \sqrt{x^2 + 1}} \qquad 83. \quad D$$

$$84. \quad C \qquad 85. \quad B \qquad 86. \quad A \qquad 87. \quad A$$

$$88. \quad A \qquad 89. \quad C \qquad 90. \quad B \qquad 91. \quad B$$

$$92. \quad A \qquad 93. \quad A \qquad 94. \quad B \qquad 95. \quad A$$

$$96. \quad B \qquad 97. \quad |x| \cdot |x-1| \qquad 98. \quad \frac{2}{3x} \qquad 99. \quad \frac{-1}{\sqrt{2}}$$

$$100. \quad \left(\frac{\sqrt{3} + 1}{2} \right) \qquad 101. \quad -1 \qquad 102. \quad \text{False} \qquad 103. \quad \text{True}$$

$$104. \quad \text{True} \qquad 105. \quad \text{True} \qquad 106. \quad \text{False}$$

6.3 EXERCISE

$$3. \quad 8 \text{ m/s} \qquad 4. \quad \left(\sqrt{2 - \sqrt{2}} \right) v \text{ unit/sec.} \qquad 5. \quad \theta = \frac{\pi}{3} \qquad 6. \quad 31.92$$

$$7. \quad 0.018\pi \text{ cm}^3 \qquad 8. \quad 2\frac{2}{3} \text{ m/s towards light, } -1 \text{ m/s}$$

$$9. \quad 2000 \text{ litres/s, } 3000 \text{ litre/s} \qquad 11. \quad 2x^3 - 3x + 1$$

$$12. \quad k^2 = 8 \qquad 14. \quad (4, 4) \qquad 15. \quad \tan^{-1} \left(\frac{4\sqrt{2}}{7} \right) \qquad 17. \quad x + 3y = \pm 8$$

$$18. \quad (3, 2), (-1, 2) \qquad 23. \quad (1, -16), \text{ max. slope} = 12$$

$$26. \quad x = 1 \text{ is the point of local maxima; local maximum} = 0 \\ x = 3 \text{ is the point of local minima; local minimum} = -28 \\ x = 0 \text{ is the point of inflection.}$$

$$27. \quad \text{Rs } 100 \qquad 30. \quad 6 \text{ cm, } 12 \text{ cm, } 864 \text{ cm}^3$$

31. 1:1 33. Rs 1920 34. $\frac{2}{3}x^3\left(1+\frac{2\pi}{27}\right)$
35. C 36. B 37. A 38. C
39. D 40. A 41. A 42. D
43. B 44. B 45. C 46. B
47. D 48. A 49. B 50. C
51. A 52. C 53. B 54. C
55. B 56. A 57. B 58. B
59. C 60. (3, 34) 61. $x + y = 0$ 62. $- , -1$
63. (1,) 64. $2\sqrt{ab}$

7.3 EXERCISE

3. $\frac{x^2}{2} - x + 3 \log|x+1| + c$ 4. $\frac{x^3}{3} + c$ 5. $\log|x - \sin x| + c$
6. $\tan \frac{x}{2} + C$ 7. $\frac{\tan^5 x}{5} - \frac{\tan^3 x}{3} + c$ 8. $x + c$
9. $-2 \cos \frac{x}{2} - 2 \sin \frac{x}{2} + c$ 10. $2 \left[\frac{x\sqrt{x}}{3} - \frac{x}{2} + \sqrt{x} - \log|\sqrt{x}+1| \right] + c$
11. $-a \left[\cos^{-1} \left(\frac{x}{a} \right) + \sqrt{1 - \frac{x^2}{a^2}} \right] + c$ 12. $\frac{4}{3} \left[x^{3/4} - \log \left| 1 + x^{3/4} \right| \right] + c$
13. $\frac{-1}{3} \left(1 + \frac{1}{x^2} \right)^{\frac{3}{2}} + c$ 14. $\frac{1}{3} \sin^{-1} \frac{3x}{4} + c$
15. $\frac{1}{\sqrt{2}} \sin^{-1} \frac{4t-3}{3} + c$
16. $3\sqrt{x^2-9} - \log|x - \sqrt{x^2-9}| + c$

$$17. \frac{x-1}{2} \sqrt{5-2x+x^2} + 2 \log \left| x-1+\sqrt{5-2x+x^2} \right| + c$$

$$18. \frac{1}{4} \log |x^2-1| - \log |x^2-1| + c$$

$$19. \frac{1}{4} \left\{ \log \left| \frac{1+x}{1-x} \right| \right\} - \frac{1}{2} \tan^{-1} x + c$$

$$20. \frac{x-a}{2} \sqrt{2ax-x^2} + \frac{a^2}{2} \sin^{-1} \left(\frac{x-a}{a} \right) + c$$

$$21. \frac{x \sin^{-1} x}{\sqrt{1-x^2}} + \log \left| \sqrt{1-x^2} \right|$$

$$22. -\frac{1}{2} \sin 2x - \sin x + c$$

$$23. \tan x - \cot x - 3x + c$$

$$24. \frac{2}{3} \sin^{-1} \sqrt{\frac{x^3}{a^3}} + c$$

$$25. 2 \sin x + x + c$$

$$26. \frac{1}{2} \sec^{-1}(x^2) + c$$

$$27. \frac{26}{3}$$

$$28. e^2 - 1$$

$$29. \tan^{-1} e - \frac{1}{4}$$

$$30. \frac{\log m}{m^2-1}$$

$$31. \pi$$

$$32. \sqrt{2} - 1$$

$$33. \frac{1}{3}$$

$$34. \frac{\sqrt{2}}{2} \tan^{-1} \frac{\sqrt{2}}{3}$$

$$35. \frac{1}{7} \log \left| \frac{x-2}{x+2} \right| + \frac{\sqrt{3}}{7} \tan^{-1} \frac{x}{\sqrt{3}} + c$$

$$36. \frac{1}{a^2-b^2} \left[a \tan^{-1} \frac{x}{a} - b \tan^{-1} \frac{x}{b} \right] + c$$

$$37. \pi$$

$$38. \log \left| \frac{\sqrt{x-3}}{x-1} \right|^{\frac{1}{6}} \left| x-2 \right|^{\frac{1}{3}} + c$$

$$39. x e^{\tan^{-1} x} + c$$

$$40. a \left[\frac{x}{a} \tan^{-1} \sqrt{\frac{x}{a}} - \sqrt{\frac{x}{a}} + \tan^{-1} \sqrt{\frac{x}{a}} \right] + c$$

$$41. \frac{3}{2}$$

$$42. \frac{e^{-3x}}{24} [\sin 3x - \cos 3x] + \frac{3e^{-3x}}{40} [\sin x - 3\cos x] + c$$

$$43. \frac{1}{\sqrt{2}} \tan^{-1} \left(\frac{\tan x - 1}{\sqrt{2} \tan x} \right) + \frac{1}{2\sqrt{2}} \log \left| \frac{\tan x - \sqrt{2} \tan x + 1}{\tan x + \sqrt{2} \tan x + 1} \right| + c$$

$$44. \frac{\pi}{4} \left(\frac{a^2 + b^2}{a^3 b^3} \right)$$

$$45. \frac{3}{8} \log 3$$

$$46. \frac{\pi^2}{2} \log \frac{1}{2}$$

$$47. \frac{\pi}{4} \log \frac{1}{2}$$

$$48. A$$

$$49. C$$

$$50. A$$

$$51. C$$

$$52. D$$

$$53. C$$

$$54. D$$

$$55. D$$

$$56. D$$

$$57. A$$

$$58. D$$

$$59. e - 1$$

$$60. \frac{e^x}{x^4} c$$

$$61. \frac{1}{2}$$

$$62. \frac{-1}{2\sqrt{3}} \tan^{-1} \frac{2\cos x}{\sqrt{3}} c$$

$$63. 0$$

8.3 EXERCISE

$$1. \frac{1}{2} \text{ sq. units}$$

$$2. \frac{4}{3} p^2 \text{ sq. units}$$

$$3. 10 \text{ sq. units}$$

$$4. \frac{16}{3} \text{ sq. units}$$

$$5. \frac{27}{2} \text{ sq. units}$$

$$6. \frac{9}{2} \text{ sq. units}$$

$$7. \frac{32}{3} \text{ sq. units}$$

$$8. 2\pi \text{ sq. units}$$

$$9. \frac{4}{3} \text{ sq. units}$$

$$10. 96 \text{ sq. units}$$

$$11. \frac{16}{3} \text{ sq. units}$$

$$12. \frac{\pi a^2}{4} \text{ sq. units}$$

$$13. \frac{1}{6} \text{ sq. units}$$

$$14. \frac{9}{2} \text{ sq. units}$$

$$15. 9 \text{ sq. units}$$

$$16. 2 \left[\pi - \frac{8}{3} \right] \text{ sq. units}$$

$$17. 4 \text{ sq. units}$$

$$18. \frac{15}{2} \text{ sq. units}$$

$$19. \frac{4}{3} (\sqrt{3} + 2\pi) a^2 \text{ sq. units}$$

$$20. 6 \text{ sq. units}$$

$$21. \frac{15}{2} \text{ sq. units}$$

$$22. 8 \text{ sq. units}$$

$$23. 15 \text{ sq. units}$$

$$24. C$$

$$25. D$$

$$26. A$$

$$27. B$$

28. A

29. A

30. D

31. A

32. B

33. A

34. C

9.3 EXERCISE

1. $2^x - 2^{-y} = k$

2. $\frac{d^2 y}{dx^2} = 0$

3. $\frac{e^6 - 9}{2}$

4. $y(x^2 - 1) = \frac{1}{2} \log \left(\left| \frac{x-1}{x+1} \right| \right) + k$

5. $y = c.e^{x-x^2}$

6. $(a+m)y = e^{mx} + ce^{-ax}$

7. $(x-c)e^{x+y} + 1 = 0$

8. $y = kxe^{\frac{-x^2}{2}}$

9. $y = \tan^{-1} x + \frac{x^2}{2}$

10. $x^2 - y^2 = c$

11. $\frac{1}{3}$

13. $(1-x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - 2 = 0$

14. $x^2 - y^2 \frac{dy}{dx} - 2xy = 0$

15. $y = \frac{4x^3}{3 + x^2}$

16. $\tan^{-1} \left(\frac{y}{x} \right) = \log |x| + c$

17. $2xe^{\tan^{-1} y} = e^{2 \tan^{-1} y} + c$

18. $\tan^{-1} \left(\frac{x}{y} \right) + \log y = c$

19. $x^2 - y^2 = k e^{x-y}$

20. $x^2 - y^2 = 3^3 e^{y^2}$

21. $y \sin x = \frac{-\cos 2x}{2} + \frac{3}{2}$

22. $xy y'' + x(y')^2 - yy' = 0$

23. $\frac{1}{2} (\tan^{-1} x)^2 + \log(1+y^2) = c$

24. $x-1 - y-2 \frac{dy}{dx} = 0$

25. $y = -\cos x + \frac{2 \sin x}{x} + \frac{2 \cos x}{x^2} + \frac{x \log x}{3} - \frac{x}{9} + cx^{-2}$

$$26. \quad x \sin y - \cos y - \sin y - ce^{-y}$$

$$28. \quad y - \frac{3 \sin 2x - 2 \cos 2x}{13} - ce^{3x}$$

$$30. \quad y - 1 - x - 1 - 2x = 0$$

$$32. \quad xy = 1 \quad 33. \quad \log\left(\frac{x}{y}\right) = cx$$

$$36. \quad A$$

$$40. \quad C$$

$$44. \quad D$$

$$48. \quad C$$

$$52. \quad B$$

$$56. \quad C$$

$$60. \quad C$$

$$64. \quad C$$

$$68. \quad C$$

$$72. \quad A$$

$$37. \quad C$$

$$41. \quad D$$

$$45. \quad B$$

$$49. \quad D$$

$$53. \quad B$$

$$57. \quad B$$

$$61. \quad C$$

$$65. \quad A$$

$$69. \quad C$$

$$73. \quad C$$

$$76. \quad (i) \text{ not defined} \quad (ii) \text{ not defined} \quad (iii) 3$$

$$(iv) \quad \frac{dy}{dx} + py = Q$$

$$(vi) \quad y - \frac{x^2}{4} - cx^2$$

$$(viii) \quad xy = Ae^{-y}$$

$$(x) \quad x = c \sec y$$

$$77. \quad (i) \text{ True}$$

$$(v) \text{ False}$$

$$(ix) \text{ True}$$

$$(ii) \text{ True}$$

$$(vi) \text{ False}$$

$$(x) \text{ True}$$

$$27. \quad \log \left| 1 + \tan \frac{x}{2} \frac{y}{2} \right| = x - c$$

$$29. \quad 2x^2 - y^2 - 3x$$

$$31. \quad ke^{2x} - 1 - x - y - 1 - x - y$$

$$34. \quad D$$

$$38. \quad B$$

$$42. \quad A$$

$$46. \quad B$$

$$50. \quad A$$

$$54. \quad B$$

$$58. \quad A$$

$$62. \quad D$$

$$66. \quad D$$

$$70. \quad A$$

$$74. \quad B$$

$$35. \quad C$$

$$39. \quad C$$

$$43. \quad C$$

$$47. \quad C$$

$$51. \quad A$$

$$55. \quad B$$

$$59. \quad A$$

$$63. \quad C$$

$$67. \quad D$$

$$71. \quad A$$

$$75. \quad A$$

$$(v) \quad xe^{\int p_1 dy} = \int \left(Q_1 \times e^{\int p_1 dy} \right) dy + c$$

$$(vii) \quad 3y - 1 - x^2 - 4x^3 - c$$

$$(ix) \quad y - ce^{-x} - \frac{\sin x}{2} - \frac{\cos x}{2}$$

$$(xi) \quad \frac{e^x}{x}$$

$$(iii) \text{ True}$$

$$(vii) \text{ True}$$

$$(xi) \text{ True}$$

$$(iv) \text{ True}$$

$$(viii) \text{ True}$$

10.3 EXERCISE

1. $\frac{1}{3} 2\hat{i} \quad \hat{j} \quad 2\hat{k}$ 2. (i) $\frac{1}{3} 2\hat{i} \quad \hat{j} - 2\hat{k}$ (ii) $\frac{1}{\sqrt{37}} \hat{j} \quad 6\hat{k}$
3. $\frac{1}{7} -2\hat{i} \quad 3\hat{j} - 6\hat{k}$ 4. $\vec{c} = \frac{3\vec{b} - \vec{a}}{2}$ 5. $k = -2$ 6. $2\hat{i} \quad \hat{j} \quad \hat{k}$
7. $\frac{2}{7}, \frac{3}{7}, \frac{-6}{7}; 4\hat{i}, 6\hat{j}, -12\hat{k}$ 8. $2\hat{i} \quad 4\hat{j} \quad 4\hat{k}$ 9. $\cos^{-1} \frac{1}{\sqrt{156}}$

10. Area of the parallelograms formed by taking any two sides represented by $\vec{a}, \vec{b}$ and $\vec{c}$ as adjacent are equal

11. $\frac{2}{\sqrt{7}}$ 12. $\sqrt{21}$ 13. $\frac{\sqrt{274}}{2}$
16. $\hat{n} = \frac{\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}}{|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}|}$ 17. $\frac{\sqrt{62}}{2}$
18. $\frac{1}{3} 5\vec{i} \quad 2\vec{j} \quad 2\vec{k}$

19. C 20. D 21. C 22. B
23. D 24. A 25. D 26. D
27. D 28. A 29. C 30. A
31. C 32. C 33. B

34. If $\vec{a}$ and $\vec{b}$ are equal vectors

35. 0 36. $\frac{4}{9}$ 37. $k \in]-1, 1[\mid k \neq -\frac{1}{2}$ 38. $|\vec{a}|^2 |\vec{b}|^2$
39. 3 40. $\vec{a}$ 41. True 42. True
43. True 44. False 45. False

11.3 EXERCISE

1. $5\hat{i} + 5\sqrt{2}\hat{j} + 5\hat{k}$ 2. $(x-1)\hat{i} + (y+2)\hat{j} + (z-3)\hat{k} = \lambda(3\hat{j} - 2\hat{j} + 6\hat{k})$
3. $(-1, -1, -1)$

4. $\cos^{-1}\left(\frac{19}{21}\right)$ 7. $x + y + 2z = 19$ 8. $x + y + z = 9$
9. $3x - 2y + 6z - 27 = 0$ 10. $21x + 9y - 3z - 51 = 0$
11. $\frac{x}{1} = \frac{y}{2} = \frac{z}{-1}$ and $\frac{x}{-1} = \frac{y}{1} = \frac{z}{-2}$ 12. 60°
14. $ax + by + cz = a^2 + b^2 + c^2$ 14. $(1, 1)$
15. 15° or 75° 16. $(2, 6, -2)$ $3\sqrt{5}$
17. 7 18. $\sqrt{6}$
19. $(x-3)\hat{j} + y\hat{j} + (z-1)\hat{k} = \lambda(-2\hat{i} + \hat{j} + 3\hat{k})$
20. $18x + 17y + 4z = 49$ 21. 14 22. $51x + 15y - 50z + 173 = 0$
24. $4x + 2y - 4z - 6 = 0$ and $-2x + 4y + 4z - 6 = 0$
26. $3\hat{i} + 8\hat{j} + 3\hat{k}, -3\hat{i} - 7\hat{j} + 6\hat{k}$ 29. D 30. D
31. A 32. D 33. D 34. A
35. D 36. C 37. $\frac{x}{2} + \frac{y}{3} + \frac{z}{4} = 1$
38. $\frac{2}{3}, \frac{2}{3}, \frac{-1}{3}$ 39. $(x-5)\hat{i} + (y+4)\hat{j} + (z-6)\hat{k} = \lambda(3\hat{i} + 7\hat{j} + 2\hat{k})$
40. $(x-3)\hat{i} + (y-4)\hat{j} + (z+7)\hat{k} = \lambda(-2\hat{i} - 5\hat{j} + 13\hat{k})$ 41. $x + y - z = 2$
42. True 43. True 44. False 45. False
46. True 47. True 48. False 49. True

12.3 EXERCISE

1. 42 2. 4 3. 47 4. -30
5. 196 6. 43 7. 21 8. 47
9. Minimum value = 3 10. Maximum = 9, minimum = $3\frac{1}{7}$

11. Maximise $Z = 50x - 60y$, subject to:

$$2x + y \leq 20, x + 2y \leq 12, x + 3y \leq 15, x \geq 0, y \geq 0$$

12. Minimise $Z = 400x - 200y$, subject to:

$$5x - 2y \leq 30$$

$$2x - y \leq 15$$

$$x \geq y, x \geq 0, y \geq 0$$

13. Maximise $Z = 100x - 170y$ subject to :

$$3x - 2y \leq 3600, x - 4y \leq 1800, x \geq 0, y \geq 0$$

14. Maximise $Z = 200x - 120y$ subject to :

$$x - y \leq 300, 3x - y \leq 600, y - x \leq 100, x \geq 0, y \geq 0$$

15. Maximise $Z = x - y$, subject to

$$2x + 3y \leq 120, 8x + 5y \leq 400, x \geq 0, y \geq 0$$

16. Type A : 6, Type B : 3; Maximum profit = Rs. 480

17. 2571.43

18. 138600

19. 150 sweaters of each type and maximum profit = Rs 48,000

20. $54\frac{2}{7}$ km.

21. $3\frac{10}{11}$

22. Model X : 25, Model Y : 30 and maximum profit = Rs 40,000

23. Tablet X : 1, Tablet Y : 6

24. Factory I : 80 days, Factory II : 60 days

25. Maximum : 12, Minimum does not exist

26. B

27. B

28. A

29. D

30. C

31. D

32. D

33. A

34. B

35. Linear constraints

36. Linear

37. Unbounded

38. Maximum

39. Bounded

40. Intersection

41. Convex

42. True

43. False

44. False

45. True

13.3 EXERCISE

1. Independent 2. not independent 3. 1.1 4. $\frac{25}{56}$
5. $P(E) = \frac{1}{12}$, $P(F) = \frac{5}{18}$, $P(G) = \frac{7}{36}$, no pair is independent
7. (i) $\frac{3}{4}$, (ii) $\frac{1}{2}$, (iii) $\frac{1}{4}$, (iv) $\frac{5}{8}$ 8. $\frac{3}{4}$, $\frac{3}{10}$
9. (i) E_1 and E_2 occur
 (ii) E_1 does not occur, but E_2 occurs
 (iii) Either E_1 or E_2 , or both E_1 and E_2 occurs
 (iv) Either E_1 or E_2 occurs, but not both
10. (i) $\frac{1}{3}$, (ii) $\frac{23}{18}$ 12. $\frac{\sqrt{3}}{2}$ 13. Rs 0.50 14. $\frac{1}{10}$
15. Expectation = Rs 0.65 16. $\frac{85}{153}$ 17. $\frac{7}{15}$
18. $\frac{5}{9}$ 19. $\frac{1}{270725}$ 20. $\frac{5}{16}$ 21. $\frac{7}{128}$
22. $\frac{4547}{8192}$ 23. $1 - \frac{9}{10}^8$ 24. (i) .1118 (ii) .4475
25. (i) $\frac{8}{15}$, (ii) $\frac{14}{15}$, $\frac{1}{15}$, (iii) 1 26. 0.7 (approx.) 27. 0.18
28. $\frac{1}{2}$ 29.

X	0	1	2
P (X)	.54	.42	.04
31. (i) $\left(\frac{49}{50}\right)^{10}$ (ii) $\frac{45(49)^8}{(50)^{10}}$ (iii) $\frac{59(49)^9}{(50)^{10}}$

32. $\frac{1}{3}$

33. $\frac{9}{44}$

34. $\frac{p-1}{n-1}$

35.

X	1	2	3	4	5	6
P(X)	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$

36. $p = \frac{1}{2}$

37. $\frac{665}{324}$

38. $\frac{775}{7776}$

39. not independent

41. (i) $\frac{7}{18}$, (ii) $\frac{11}{18}$

42. (i) $\frac{2}{11}$, (ii) $\frac{9}{11}$

43. (i) 0.49, (ii) 0.65, (iii) .314

44. $\frac{7}{11}$

45. $\frac{11}{21}$

46. $\frac{1}{3}$

47. $\frac{110}{221}$

48. $\frac{5}{11}$

49. (i) $\frac{1}{50}$, (ii) 5.2, (iii) 1.7 (approx.)

50. (i) 3, (ii) 19.05

51. (i) 4.32, (ii) 61.9, (iii) $\frac{15}{22}$

52. 10

53. Mean $\frac{2}{13}$, S.D. = 0.377

54. $\frac{1}{2}$

55. Mean = 6, Variance = 3

56. C

57. A

58. D

59. C

60. C

61. D

62. B

63. D

64. C

65. D

66. D

67. D

68. C

69. D

70. D

71. D

72. C

73. C

74. C

75. B

76. B

77. D

78. C

79. A

80. D

81. B

82. C

83. C

84. A

85. B

86. A

87. C

88. D

89. D

90. A

91. B

92. D

93. D

94. False

95. True

96. False

97. False

98. True

99. True

100. True

101. True

102. False

103. True

104. $\frac{1}{3}$

105. $\frac{10}{9}$

106. $\frac{1}{10}$

107. $\sum p_i x_i^2 - (\sum p_i x_i)^2$

108. independent