

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. $f(f(x)) = x^4 - 6x^3 + 10x^2 - 3x$
7. $\alpha = 2, \beta = -1$
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. $\left[\frac{1}{3}, 1\right]$
17. Domain of $R = \{1, 2, 3, 4, \dots, 20\}$ and
Range of $R = \{1, 3, 5, 7, 9, \dots, 39\}$. R is neither reflective, 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. $\frac{\pi}{4}$ 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) $a_{23} = x^2 - y, a_{31} = 0, a_{12} = 1$

3. (i) $\begin{bmatrix} \frac{1}{2} & \frac{9}{2} \\ 2 & 2 \\ 0 & 2 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & 4 \\ -1 & 2 \end{bmatrix}$

4. $\begin{bmatrix} e^x \sin x & e^x \sin 2x \\ e^{2x} \sin x & e^{2x} \sin 2x \\ e^{3x} \sin x & e^{3x} \sin 2x \end{bmatrix}$

5. $a = 2, b = 2$

6. Not possible

7. (i) $X + Y = \begin{bmatrix} 5 & 2 & -2 \\ 12 & 0 & 1 \end{bmatrix}$

(ii) $2X - 3Y = \begin{bmatrix} 0 & -1 & 1 \\ -11 & -10 & -18 \end{bmatrix}$

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

$$8. \quad x = 4$$

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

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

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

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

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

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

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

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

where k is a real number

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

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

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

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

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

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

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

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

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

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

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

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. Symmetric matrix

75. Symmetric 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. $n(2ax + b) \sin^{n-1}(ax^2 + bx + c) \cos(ax^2 + bx + c)$
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. $(\sin x)^{\cos x} \left[\frac{\cos^2 x}{\sin x} - \sin x \cdot \log \sin x \right]$ 35. $\sin^{mx} x \cos^n x (-n \tan x + m \cot x)$
36. $(x+1)(x+2)^2(x+3)^3[9x^2 + 34x + 29]$
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 $x = 1$

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

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

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

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

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

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

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

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

6.3 EXERCISE

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

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

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

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

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

$$26. x = 1 \text{ is the point of local maxima; local maximum} = 0$$

$$x = 3 \text{ is the point of local minima; local minimum} = -28$$

$$x = 0 \text{ is the point of inflection.}$$

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

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. $(-\infty, -1)$
 63. $(1, \infty)$ 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. $\frac{1}{\sqrt{2}}\sin^{-1}\left(\frac{4t-3}{3}\right) + c$
 16. $3\sqrt{x^2+9} - \log|x + \sqrt{x^2+9}| + c$

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

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

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

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

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

$$22. - \left(\frac{1}{2} \sin 2x + \sin x \right) + c$$

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

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

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

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

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

$$28. e^2 - 1$$

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

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

$$31. \pi$$

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

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

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

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

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

$$37. \pi$$

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

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

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

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

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

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

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

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

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

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

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}

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

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

$$62. \frac{-1}{2\sqrt{3}} \tan^{-1} \left(\frac{2\cos x}{\sqrt{3}} \right) + c$$

$$63. 0$$

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

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. $y = \tan \left(x + \frac{x^2}{2} \right)$

10. $x = y(y^2 + c)$

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

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

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

15. $y = \frac{4x^3}{3(1+x^2)}$

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. $x + y = ke^{x-y}$

20. $x^2(y+3)^3 = e^{y+2}$

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

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

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

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

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

$$26. \quad x(\sin y + \cos y) = \sin y + ce^{-y}$$

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

$$28. \quad y = - \left[\frac{3 \sin 2x + 2 \cos 2x}{13} \right] + ce^{3x}$$

$$29. \quad 2(x^2 - y^2) = 3x$$

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

$$31. \quad ke^{2x}(1-x+y) = 1+x-y$$

$$32. \quad xy = 1$$

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

$$34. \quad D$$

$$35. \quad C$$

$$36. \quad A$$

$$37. \quad C$$

$$38. \quad B$$

$$39. \quad C$$

$$40. \quad C$$

$$41. \quad D$$

$$42. \quad A$$

$$43. \quad C$$

$$44. \quad D$$

$$45. \quad B$$

$$46. \quad B$$

$$47. \quad C$$

$$48. \quad C$$

$$49. \quad D$$

$$50. \quad A$$

$$51. \quad A$$

$$52. \quad B$$

$$53. \quad B$$

$$54. \quad B$$

$$55. \quad B$$

$$56. \quad C$$

$$57. \quad B$$

$$58. \quad A$$

$$59. \quad A$$

$$60. \quad C$$

$$61. \quad C$$

$$62. \quad D$$

$$63. \quad C$$

$$64. \quad C$$

$$65. \quad A$$

$$66. \quad D$$

$$67. \quad D$$

$$68. \quad C$$

$$69. \quad C$$

$$70. \quad A$$

$$71. \quad A$$

$$72. \quad A$$

$$73. \quad C$$

$$74. \quad B$$

$$75. \quad A$$

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

$$(ii) \text{ not defined}$$

$$(iii) 3$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

10.3 EXERCISE

1. $\frac{1}{3}(2\hat{i} + \hat{j} + 2\hat{k})$ 2. (i) $\frac{1}{3}(2\hat{i} + \hat{j} - 2\hat{k})$ (ii) $\frac{1}{\sqrt{37}}(\hat{j} + 6\hat{k})$
3. $\frac{1}{7}(-2\hat{i} + 3\hat{j} - 6\hat{k})$ 4. $\vec{c} = \frac{3\vec{b} - \vec{a}}{2}$ 5. $k = -2$ 6. $\pm 2(\hat{i} + \hat{j} + \hat{k})$
7. $\frac{2}{7}, \frac{3}{7}, \frac{-6}{7}; 4\hat{i}, 6\hat{j}, -12\hat{k}$ 8. $-2\hat{i} + 4\hat{j} + 4\hat{k}$ 9. $\cos^{-1}\left(\frac{1}{\sqrt{156}}\right)$
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. $\frac{1}{3}(5\vec{i} + 2\vec{j} + 2\vec{k})$
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. $\frac{\pi}{4}$ 37. $k \in]-1, 1[$ $k \neq -\frac{1}{2}$ 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:

$$5x + 2y \geq 30$$

$$2x + y \leq 15$$

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

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 :

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

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. $1 - \left(\frac{9}{10}\right)^8$ 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

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