ANSWERS

1.3 EXERCISE

1. $(b,b),\ (c,c),\ (a,c)$

2. [-5,5]

3. $4x^2+4x-1$

4. $f^{-1}(x)=\dfrac{x+3}{2}$

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. $fog=\{(2,5),(5,2),(1,5)\}$

12. (i) f is not function (ii) g is function (iii) h is function (iv) k is not function

14. $\left[\dfrac{1}{3},1\right]$

17. Domain of R = {1,2,3,4, ... 20} and

Range of R = {1,3,5,7,9, ... 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) $(fog)(x) = 4x^2 - 6x + 1$

(ii) $(gof)(x) = 2x^2 + 6x - 1$

(iii) $(fof)(x) = x^4 + 6x^3 + 14x^2 + 15x + 5$

(iv) $(gog)(x) = 4x - 9$

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. $gof = \{(1,3),(3,1),(4,3)\}$ and $fog = \{(2,5),(5,2),(1,5)\}$

51. $(fofof)(x) = \dfrac{x}{\sqrt{3x^2+1}}$ **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.** $\dfrac{-\pi}{12}$	**5.** $-\dfrac{\pi}{3}$
7. $0, -1$	**8.** $\dfrac{14}{15}$	**11.** $\dfrac{-3}{4}, \dfrac{3}{4}$	

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) $\begin{bmatrix} \frac{1}{2} & \frac{9}{2} \\ 0 & 2 \end{bmatrix}$ (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. $x = 4$

10. $-2, -14$

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

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

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

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

18. $x = 1, y = 2$

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

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

where k is a real number

24. $A = [-4]$

30. True when $AB = BA$

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

38. $x = 2, y = 4$ or $x = 4, y = 2, z = -6, w = 4$

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

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

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

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

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

44. True for all real values of α

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

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. 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. $\theta = n\pi \quad \text{or } n\pi + (-1)^n \left(\frac{\pi}{6}\right)$ **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.** $\frac{5}{x\log\left(x^5\right)\log\left(\log x^5\right)}$

29. $\frac{\cos\sqrt{x}}{2\sqrt{x}}-\frac{\sin 2\sqrt{x}}{2\sqrt{x}}$ **30.** $n(2ax+b)\sin^{n-1}\left(ax^2+bx+c\right)\cos\left(ax^2+bx+c\right)$

31. $\frac{-1}{2\sqrt{x+1}}\sin\left(\tan\sqrt{x+1}\right)\sec^2\left(\sqrt{x+1}\right)$

32. $2x\cos(x)^2+2x\sin\left(2x^2\right)+\sin 2x$ **33.** $\frac{-1}{2\sqrt{x}(x+1)}$

34. $(\sin x)^{\cos x}\left[\frac{\cos^2 x}{\sin x}-\sin x.\log\sin x\right]$ **35.** $\sin^{mx}x\cos^n x\left(-n\tan x+m\cot x\right)$

36. $(x+1)(x+2)^2(x+3)^3\left[9x^2+34x+29\right]$

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

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

84. C **85.** B **86.** A **87.** A

88. A **89.** C **90.** B **91.** B

92. A **93.** A **94.** B **95.** A

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

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

104. True **105.** True **106.** False

6.3 EXERCISE

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

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

9. 2000 litres/s, 3000 litre/s **11.** $2x^3 - 3x + 1$

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

18. (3, 2), (–1, 2) **23.** (1, – 16), max. slope = 12

26. $x = 1$ is the point of local maxima; local maximum = 0
$x = 3$ is the point of local minima; local minimum = – 28
$x = 0$ is the point of inflection.

27. Rs 100 **30.** 6cm, 12 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.** $\frac{4}{3}\left[x^{3/4} - \log\left|1 + x^{\frac{3}{4}}\right|\right] + c$

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. $3\sqrt{x^2+9} - \log\left|x + \sqrt{x^2+9}\right| + c$

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

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

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. π

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. π

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

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

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. $\frac{\pi}{4}\left(\frac{a^2+b^2}{a^3b^3}\right)$ **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. $\frac{1}{2}$ sq.units **2.** $\frac{4}{3}p^2$ sq. units **3.** 10 sq.units **4.** $\frac{16}{3}$ sq.units

5. $\frac{27}{2}$ sq.units **6.** $\frac{9}{2}$ sq. units **7.** $\frac{32}{3}$ sq. units **8.** 2π sq.units

9. $\frac{4}{3}$ sq.units **10.** 96 sq.units **11.** $\frac{16}{3}$ sq.units **12.** $\frac{\pi a^2}{4}$ sq. units

13. $\frac{1}{6}$ sq. units **14.** $\frac{9}{2}$ sq. units **15.** 9 sq.units **16.** $2\left[\pi-\frac{8}{3}\right]$ sq.units

17. 4 sq.units **18.** $\frac{15}{2}$ sq. units **19.** $\frac{4}{3}\left(\sqrt{3}+2\pi\right)a^2$ sq. units

20. 6 sq.units **21.** $\frac{15}{2}$ sq. units **22.** 8 sq.units **23.** 15 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. $y\left(x^2-1\right)=\frac{1}{2}\log\left(\left|\frac{x-1}{x+1}\right|\right)+k$ **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.** $x=y\left(y^2+c\right)$ **11.** $\frac{1}{3}$

13. $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}-2=0$ **14.** $\left(x^2-y^2\right)\frac{dy}{dx}-2xy=0$

15. $y=\frac{4x^3}{3\left(1+x^2\right)}$ **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. $x+y=k\,e^{x-y}$ **20.** $x^2(y+3)^3=e^{y+2}$ **21.** $y\sin x=\frac{-\cos 2x}{2}+\frac{3}{2}$

22. $xy\,y''+x(y')^2-yy'=0$ **23.** $\frac{1}{2}\left(\tan^{-1}x\right)^2+\log\left(1+y^2\right)=c$

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. $x(\sin y+\cos y)=\sin y+ce^{-y}$ **27.** $\log\left|1+\tan\left(\frac{x+y}{2}\right)\right|=x+c$

28. $y=-\left[\frac{3\sin 2x+2\cos 2x}{13}\right]+ce^{3x}$ **29.** $2\left(x^2-y^2\right)=3x$

30. $(y-1)(x+1)+2x=0$ **31.** $ke^{2x}(1-x+y)=1+x-y$

32. $xy=1$ **33.** $\log\left(\frac{x}{y}\right)=cx$ **34.** D **35.** C

36. A **37.** C **38.** B **39.** C

40. C **41.** D **42.** A **43.** C

44. D **45.** B **46.** B **47.** C

48. C **49.** D **50.** A **51.** A

52. B **53.** B **54.** B **55.** B

56. C **57.** B **58.** A **59.** A

60. C **61.** C **62.** D **63.** C

64. C **65.** A **66.** D **67.** D

68. C **69.** C **70.** A **71.** A

72. A **73.** C **74.** B **75.** A

76. (i) not defined (ii) not defined (iii) 3

(iv) $\frac{dy}{dx}+py=Q$ (v) $xe^{\int p_1 dy}=\int\left(Q_1\times e^{\int p_1 dy}\right)dy+c$

(vi) $y=\frac{x^2}{4}+cx^{-2}$ (vii) $3y\left(1+x^2\right)=4x^3+c$

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

(x) $x = c \sec y$ (xi) $\frac{e^x}{x}$

77. (i) True (ii) True (iii) True (iv) True

(v) False (vi) False (vii) True (viii) True

(ix) True (x) True (xi) True

10.3 EXERCISE

1. $\frac{1}{3}\left(2\hat{i}+\hat{j}+2\hat{k}\right)$ **2.** (i) $\frac{1}{3}\left(2\hat{i}+\hat{j}-2\hat{k}\right)$ (ii) $\frac{1}{\sqrt{37}}\left(\hat{j}+6\hat{k}\right)$

3. $\frac{1}{7}\left(-2\hat{i}+3\hat{j}-6\hat{k}\right)$ **4.** $\vec{c}=\frac{3\bar{b}-\bar{a}}{2}$ **5.** $k = -2$ **6.** $\pm 2\left(\hat{i}+\hat{j}+\hat{k}\right)$

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 $\bar{a},\bar{b}$ and $\bar{c}$ as adjacent are equal

11. $\frac{2}{\sqrt{7}}$ **12.** $\sqrt{21}$ **13.** $\frac{\sqrt{274}}{2}$

16. $\hat{n}=\frac{\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}}{\left|\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}\right|}$ **17.** $\frac{\sqrt{62}}{2}$

18. $\frac{1}{3}\left(5\vec{i}+2\vec{j}+2\vec{k}\right)$

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 $\bar{a}$ and $\bar{b}$ are equal vectors

35. 0 **36.** $\frac{\pi}{4}$ **37.** $k\in\left]-1,1\right[k\neq-\frac{1}{2}$ **38.** $\left|\vec{a}\right|^2\left|\vec{b}\right|^2$

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)	36	36	36	36	36	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. $\Sigma p_i x_i^2 - (\Sigma p_i x_i)^2$ **108.** independent