# ANSWERS

## 1.3 EXERCISE

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

**2.** [-5,5]

**3.** $4x^2 \quad 4x-1$

**4.** $f^{\ 1}\ x \quad \frac{x\ \ 3}{2}$

**5.** $f^{-1}\{(b,a),(d,b),(a,c),(c,d)\}$

**6.** $f\ \ f\ \ x \quad x^4-6x^3 \quad 10x^2-3x$

**7.** $2, \quad -1$

**8.** (i) represents function which is surjective but not injective

(ii) does not represent function.

**9.** $fog \quad 2,5\ ,\ 5,2\ ,\ 1,5$

**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, ..... 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.** $\left[(2,5)\right]=\{(1,4),(2,5),(3,6),(4,7)(5,8),(6,9)\}$

**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.** $\frac{}{4}$ **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.** $\phi$

**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.** $28\times1, 1\times28, 4\times7, 7\times4, 14\times2, 2\times14$. If matrix has 13 elements then its order will be either $13\times1$ or $1\times13$.

**2.** (i) 3×3, (ii) 9, (iii) $a_{23}\quad x^2-y, a_{31}\quad 0, a_{12}\quad 1$

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

**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.** $x = 4$

**10.** $-2, -14$

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

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

**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.** $\begin{matrix} -24 & -10 \\ -28 & -38 \end{matrix}$

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

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

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

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

**44.** True for all real values of $\alpha$

**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) $k$A (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 $x \quad \frac{-5}{2}$ **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.** $\frac{1}{\sqrt{x^2 \quad a}}$ **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.** $n\ 2ax\quad b\ \sin^{n-1}\ ax^2\quad bx\quad c\ \cos\ ax^2\quad bx\quad c$

**31.** $\frac{-1}{2\sqrt{x\quad 1}}\sin\quad \tan\sqrt{x\quad 1}\ \sec^2\ \sqrt{x\quad 1}$

**32.** $2x\cos\ x^{\ 2}\quad 2x\sin\ 2x^2\quad \sin 2x$ **33.** $\frac{-1}{2\sqrt{x}\ x\quad 1}$

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

**36.** $x\quad 1\quad x\quad 2^{\ 2}\ x\quad 3^{\ 3}\ 9x^2\quad 34x\quad 29$

**37.** $-1$ **38.** $\frac{1}{2}$ **39.** $\frac{1}{2}$ **40.** $-1$

**41.** $\frac{-3}{\sqrt{1-x^2}}$ **42.** $\frac{3a}{a^2\quad x^2}$ **43.** $\frac{-x}{\sqrt{1-x^4}}$ **44.** $\frac{t^2\quad 1}{t^2-1}$

**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.** $\frac{2xy^2 - y^3\cos\ xy\ - y}{xy^2\cos\ xy\ - x\quad y^2}$ **55.** $\frac{y\quad \sec\ x\quad y\ \tan\ x\quad y}{\sec\ x\quad y\ \tan\ x\quad y - x}$

**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.** , – 2 **72.** (2, –4) **77.** $\frac{7}{2}, \frac{1}{4}$ **78.** $\frac{3}{2}, 0$

**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 $\text{cm}^3$

**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.** $\log|x \quad \sin x|$ $c$

**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.** $2\left[\frac{x\sqrt{x}}{3} - \frac{x}{2} + \sqrt{x} - \log\left|\sqrt{x}+1\right|\right] + c$

**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.** $\frac{1}{\sqrt{2}}\sin^{1}\frac{4t-3}{3}$ $c$

**16.** $3\sqrt{x^2 \quad 9} - \log\left|x \quad \sqrt{x^2 \quad 9}\right|$ $c$

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

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

**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.** $-\quad\frac{1}{2}\sin 2x\quad\sin x\quad\quad c$

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

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

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

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

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

**28.** $e^2-1$

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

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

**31.** $\pi$

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

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

**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.** $\frac{1}{a^2-b^2}\quad a\tan^{\ 1}\frac{x}{a}\quad\quad b\tan^{\ 1}\frac{x}{b}\quad c$

**37.** $\pi$

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

**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.** $\frac{e^x}{x\quad 4}\quad c$ **61.** $\frac{1}{2}$ **62.** $\frac{-1}{2\sqrt{3}}\tan^{-1}\frac{2\cos x}{\sqrt{3}}\quad c$ **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.** $2\pi$ 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.** $\frac{e^6 \quad 9}{2}$

**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 $x$ $\frac{x^2}{2}$ **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.** $x$ $y$ $k\,e^{x-y}$ **20.** $x^2$ $y$ $3^{3}$ $e^{y\ 2}$ **21.** $y\sin x=\frac{-\cos 2x}{2}+\frac{3}{2}$

**22.** $xy\,y''+x\left(y'\right)^2-yy'=0$ **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.** $x \sin y \quad \cos y \quad \sin y \quad c e^{-y}$

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

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

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

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

**31.** $k e^{2x} \; 1 - x \quad y \quad 1 \quad x - y$

**32.** $xy \quad 1$

**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) $x e^{\int p_1 dy} = \int \left( Q_1 \times e^{\int p_1 dy} \right) dy + c$

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

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

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

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

(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.** $\frac{1}{3}\ 2\hat{i}\quad \hat{j}\quad 2\hat{k}$ **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.** $\vec{c}=\frac{3\bar{b}-\bar{a}}{2}$ **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 $\bar{a},\bar{b}$ and $\bar{c}$ as adjacent are equal

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

**16.** $\hat{n}\ \frac{\vec{a}\quad \vec{b}\quad \vec{b}\quad \vec{c}\quad \vec{c}\quad \vec{a}}{\left|\vec{a}\quad \vec{b}\quad \vec{b}\quad \vec{c}\quad \vec{c}\quad \vec{a}\right|}$ **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 $\bar{a}$ and $\bar{b}$ are equal vectors

**35.** 0 **36.** $\frac{}{4}$ **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 $Z = 50x \quad 60y$, subject to:

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

**12.** Minimise $Z \quad 400x \quad 200y$, subject to:

$5x \quad 2y \quad 30$

$2x \quad y \quad 15$

$x \quad y, x \quad 0, y \quad 0$

**13.** Maximise $Z = 100x \quad 170y$ subject to :

$3x \quad 2y \quad 3600, x \quad 4y \quad 1800, \quad x \quad 0, y \quad 0$

**14.** Maximise $Z = 200x \quad 120y$ subject to :

$x \quad y \quad 300, 3x \quad y \quad 600, y \quad x \quad 100, x \quad 0, \quad y \quad 0$

**15.** Maximise $Z = x \quad y$, 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.** $\Sigma\, p_i\, x_i^2 - \left(\Sigma p_i x_i\right)^2$ **108.** independent