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+2 MATHS BOOK BACK ONE MARKS

WITH ANSWERS AND IMPORTANT WORD BLACKENED



SAIVEERA ACADEMY TEST SERIES

**1. One Marks Test (Lesson wise , Half portion , Full portion)
[EM]**

2. Revision Test (4 tests) [EM]

3. Half Portion Test (2 tests) [EM]

4. Full Portion Test (10 tests) [EM]

5. Chapterwise (20 tests) [EM]

Contact

SAIVEERA ACADEMY

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+2 MATHS**SAIVEERA ACADEMY****STUDY MATERIAL****Chapter – 1 Application Of Matrices And Determinants**

1. If $|\text{adj}(\text{adj } A)| = |A|^9$, then the order of the square matrix A is

- 1) 3 2) 4 3) 2 4) 5

2. If A is a 3×3 non-singular matrix such that $AA^T = A^T A$ and $A^{-1}A^T = A^T A^{-1}$, then $BB^T =$

- 1) A 2) B 3) I 4) B^T

3. If $A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, $B = \text{adj } A$ and $C = 3A$, then $\frac{|\text{adj } B|}{|C|} =$

- 1) $\frac{1}{3}$ 2) $\frac{1}{9}$ 3) $\frac{1}{4}$ 4) 1

4. If $A \begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$, then $A =$

- 1) $\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix}$ 2) $\begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$ 3) $\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} 4 & -1 \\ 2 & 1 \end{bmatrix}$

5. If $A = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$, then $9I - A =$

- 1) A^{-1} 2) $\frac{A^{-1}}{2}$ 3) $3A^{-1}$ 4) $2A^{-1}$

6. If $A = \begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$ then $|\text{adj}(AB)| =$

- 1) -40 2) -80 3) -60 4) -20

7. If $P = \begin{bmatrix} 1 & x & 0 \\ 1 & 3 & 0 \\ 2 & 4 & -2 \end{bmatrix}$ is the adjoint of 3×3 matrix A and $|A| = 4$, then x is

- 1) 15 2) 12 3) 14 4) 11

8. If $A = \begin{bmatrix} 3 & 1 & -1 \\ 2 & -2 & 0 \\ 1 & 2 & -1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$ then the value of a_{23} is

- 1) 0 2) -2 3) -3 4) -1

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9. If **A, B and C** are invertible matrices of some order, then which one of the following is not true?

1) $\text{adj } A = |A| A^{-1}$

2) $\text{adj}(AB) = (\text{adj } A)(\text{adj } B)$

3) $\det A^{-1} = (\det A)^{-1}$

4) $(ABC)^{-1} = C^{-1}B^{-1}A^{-1}$

10. If $(AB)^{-1} = \begin{bmatrix} 12 & -17 \\ -19 & 27 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$, then $B^{-1} =$

1) $\begin{bmatrix} 2 & -5 \\ -3 & 8 \end{bmatrix}$

2) $\begin{bmatrix} 8 & 5 \\ 3 & 2 \end{bmatrix}$

3) $\begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix}$

4) $\begin{bmatrix} 8 & -5 \\ -3 & 2 \end{bmatrix}$

11. If $A^T A^{-1}$ is symmetric, then $A^2 =$

1) A^{-1}

2) $(A^T)^2$

3) A^T

4) $(A^{-1})^2$

12. If **A** is an non-singular matrix such that $A^{-1} = \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$, then $(A^T)^{-1} =$

1) $\begin{bmatrix} -5 & 3 \\ 2 & 1 \end{bmatrix}$

2) $\begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$

3) $\begin{bmatrix} -1 & -3 \\ 2 & 5 \end{bmatrix}$

4) $\begin{bmatrix} 5 & -2 \\ 3 & -1 \end{bmatrix}$

13. If $A = \begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ \frac{5}{x} & \frac{3}{5} \end{bmatrix}$ and $A^T = A^{-1}$, then the value of x is

1) $\frac{-4}{5}$

2) $\frac{-3}{5}$

3) $\frac{3}{5}$

4) $\frac{4}{5}$

14. If $A = \begin{bmatrix} 1 & \tan \frac{\theta}{2} \\ -\tan \frac{\theta}{2} & 1 \end{bmatrix}$ and $AB = I$, then $B =$

1) $(\cos^2 \frac{\theta}{2}) A$

2) $(\cos^2 \frac{\theta}{2}) A^T$

3) $(\cos^2 \theta) I$

4) $(\sin^2 \frac{\theta}{2}) A$

15. If $A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$ and $A(\text{adj } A) = \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$, then $k =$

1) 0

2) $\sin \theta$

3) $\cos \theta$

4) 1

16. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that $\lambda A^{-1} = A$, then λ is

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1) 17

2) 14

3) 19

4) 21

17. If $\text{adj}A = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$ and $\text{adj}B = \begin{bmatrix} 1 & -2 \\ -3 & 1 \end{bmatrix}$ then $\text{adj}(AB)$ is

1) $\begin{bmatrix} -7 & -1 \\ 7 & -9 \end{bmatrix}$

2) $\begin{bmatrix} -6 & 5 \\ -2 & -10 \end{bmatrix}$

3) $\begin{bmatrix} -7 & 7 \\ -1 & -9 \end{bmatrix}$

4) $\begin{bmatrix} -6 & -2 \\ 5 & -10 \end{bmatrix}$

18. The **rank** of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ -1 & -2 & -3 & -4 \end{bmatrix}$ is

1) 1

2) 2

3) 4

4) 3

19. If $x^a y^b = e^m$, $x^c y^d = e^n$, $\Delta_1 = \begin{vmatrix} m & b \\ n & d \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} a & m \\ c & n \end{vmatrix}$, $\Delta_3 = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$, then the values of x and y are respectively,

1) $e^{(\Delta_2/\Delta_1)}, e^{(\Delta_3/\Delta_1)}$

2) $\log(\Delta_1/\Delta_3), \log(\Delta_2/\Delta_3)$

3) $\log(\Delta_2/\Delta_1), \log(\Delta_3/\Delta_1)$

4) $e^{(\Delta_1/\Delta_3)}, e^{(\Delta_2/\Delta_3)}$

20. Which of the following is/are **correct**?

(i) Adjoint of a symmetric matrix is also a symmetric matrix.

(ii) Adjoint of a diagonal matrix is also a diagonal matrix.

(iii) If A is a square matrix of order n and λ is a scalar, then $\text{adj}(\lambda A) = \lambda^n \text{adj}(A)$.

(iv) $A(\text{adj } A) = (\text{adj } A)A = |A|I$

1) only (i)

2) (ii) and (iii)

3) (iii) and (iv)

4) (i), (ii) and (iv)

21. If $\rho(A) = \rho([A|B])$, then the system $AX = B$ of linear equations is

1) consistent and has a unique solution

2) consistent

3) consistent and has infinitely many solution

4) inconsistent

22. If $0 \leq \theta \leq \pi$ and the system of equation $x + (\sin\theta)y - (\cos\theta)z = 0$, $(\cos\theta)x - y + z = 0$, $(\sin\theta)x + y - z = 0$ has a **non-trivial solution** then θ is

1) $\frac{2\pi}{3}$

2) $\frac{3\pi}{4}$

3) $\frac{5\pi}{6}$

4) $\frac{\pi}{4}$

23. The augmented matrix of a system of linear equation is $\begin{bmatrix} 1 & 2 & 7 & 3 \\ 0 & 1 & 4 & 6 \\ 0 & 0 & \lambda - 7\mu + 5 \end{bmatrix}$. The

system has **infinitely many solutions** if

1) $\lambda = 7, \mu \neq -5$

2) $\lambda = -7, \mu = 5$

3) $\lambda \neq 7, \mu \neq -5$

4) $\lambda = 7, \mu = -5$

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24. Let $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and $4B = \begin{bmatrix} 3 & 1 & -1 \\ 1 & 3 & x \\ -1 & 1 & 3 \end{bmatrix}$. If B is the inverse of A, then value of x is

- 1) 2 2) 4 3) 3 4) 1

25. If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, then $\text{adj}(\text{adj } A)$ is

- 1) $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ 2) $\begin{bmatrix} 6 & -6 & 8 \\ 4 & -6 & 8 \\ 0 & -2 & 2 \end{bmatrix}$ 3) $\begin{bmatrix} -3 & 3 & -4 \\ -2 & 3 & -4 \\ 0 & 1 & -1 \end{bmatrix}$ 4) $\begin{bmatrix} 3 & -3 & 4 \\ 0 & -1 & 1 \\ 2 & -3 & 4 \end{bmatrix}$

Chapter – 2 Complex Numbers

1. $i^n + i^{n+1} + i^{n+2} + i^{n+3}$ is

- 1) 0 2) 1 3) -1 4) i

2. The value of $\sum_{i=1}^{13} (i^n + i^{n-1})$ is

- 1) i^{n+1} 2) i 3) 1 4) 0

3. The **area of the triangle** formed by the complex numbers **z, iz, and z+iz** in the Argand's diagram is

- 1) $\frac{1}{2} |z|^2$ 2) $|z|^2$ 3) $\frac{3}{2} |z|^2$ 4) $2|z|^2$

4. The **conjugate** of a complex number is $\frac{1}{i-2}$. Then, **the complex number** is

- 1) $\frac{1}{i+2}$ 2) $\frac{-1}{i+2}$ 3) $\frac{-1}{i-2}$ 4) $\frac{1}{i-2}$

5. If $z = \frac{(\sqrt{3}+i)^3(3i+4)^2}{(8+6i)^2}$, then $|z|$ is equal to

- 1) 0 2) 1 3) 2 4) 3

6. If z is a non zero complex number, such that $2iz^2 = \bar{z}$ then $|z|$ is

- 1) $\frac{1}{2}$ 2) 1 3) 2 4) 3

7. If $|z - 2 + i| \leq 2$, then the **greatest value of $|z|$** is

- 1) $\sqrt{3} - 2$ 2) $\sqrt{3} + 2$ 3) $\sqrt{5} - 2$ 4) $\sqrt{5} + 2$

8. If $\left| z - \frac{3}{z} \right| = 2$, then the **least value of $|z|$** is

- 1) 1 2) 2 3) 3 4) 5

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9. If $|z| = 1$, then the value of $\frac{1+z}{1+\bar{z}}$ is

- 1) z 2) \bar{z} 3) $\frac{1}{z}$ 4) 1

10. The solution of the equation $|z| - z = 1 + 2i$ is

- 1) $\frac{3}{2} - 2i$ 2) $-\frac{3}{2} + 2i$ 3) $2 - \frac{3}{2}i$ 4) $2 + \frac{3}{2}i$

11. If $|z_1| = 1, |z_2| = 2, |z_3| = 3$ and $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 12$, then the value of $|z_1 + z_2 + z_3|$ is

- 1) 1 2) 2 3) 3 4) 4

12. If z is a complex number such that $z \in \mathbb{C} \setminus \mathbb{R}$ and $z + \frac{1}{z} \in \mathbb{R}$, then $|z|$ is

- 1) 0 2) 1 3) 2 4) 3

13. If z_1, z_2 and z_3 are complex numbers such that $z_1 + z_2 + z_3 = 0$ and $|z_1| = |z_2| = |z_3| = 1$ then $z_1^2 + z_2^2 + z_3^2$ is

- 1) 3 2) 2 3) 1 4) 0

14. If $\frac{z-1}{z+1}$ is purely **imaginary**, then $|z|$ is

- 1) $\frac{1}{2}$ 2) 1 3) 2 4) 3

15. If $z = x + iy$ is a complex number such that $|z + 2| = |z - 2|$, then the **locus of z** is

- 1) real axis 2) **imaginary axis** 3) ellipse 4) circle

16. The principal **argument of** $\frac{3}{-1+i}$ is

- 1) $\frac{-5\pi}{6}$ 2) $\frac{-2\pi}{3}$ 3) $\frac{-3\pi}{4}$ 4) $\frac{-\pi}{2}$

17. The principal **argument of** $(\sin 40^\circ + i \cos 40^\circ)^5$ is

- 1) -110° 2) -70° 3) 70° 4) 110°

18. If $(1 + i)(1 + 2i)(1 + 3i) \dots (1 + ni) = x + iy$, then $2.5.10 \dots (1+n^2)$ is

- 1) 1 2) i 3) $x^2 + y^2$ 4) $1 + n^2$

19. If $\omega \neq 1$ is a **cubic root of unity** and $(1+\omega)^7 = A + B\omega$, then (A, B) equals

- 1) (1,0) 2) (-1,1) 3) (0,1) 4) (1,1)

20. The principal **argument** of the complex number $\frac{(1+i\sqrt{3})^2}{4i(1-i\sqrt{3})}$ is

- 1) $\frac{2\pi}{3}$ 2) $\frac{\pi}{6}$ 3) $\frac{5\pi}{6}$ 4) $\frac{\pi}{2}$

21. If α and β are the roots of $x^2 + x + 1 = 0$, then $\alpha^{2020} + \beta^{2020}$ is

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1) -2

2) -1

3) 1

4) 2

22. The **product** of all **four values** of $(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3})^{\frac{3}{4}}$ is

1) -2

2) -1

3) 1

4) 2

23. If $\omega \neq 1$ is a cubic root of unity and $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2 - 1 & \omega^2 \\ 1 & \omega^2 & \omega^7 \end{vmatrix} = 3k$, then k is equal to

1) 1

2) -1

3) $\sqrt{3}i$ 4) $-\sqrt{3}i$

24. The value of $\left(\frac{1+\sqrt{3}i}{1-\sqrt{3}i}\right)^{10}$ is

1) $\text{cis } \frac{2\pi}{3}$ 2) $\text{cis } \frac{4\pi}{3}$ 3) $-\text{cis } \frac{2\pi}{3}$ 4) $-\text{cis } \frac{4\pi}{3}$

25. If $\omega = \text{cis } \frac{2\pi}{3}$, then the number of distinct roots of $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0$

1) 1

2) 2

3) 3

4) 4

Chapter – 3 Theory of Equation

1. A zero of $x^3 + 64$ is

1) 0

2) 4

3) $4i$

4) -4

2. If f and g are polynomials of degrees m and n respectively, and if $h(x) = (f \circ g)(x)$, then the **degree of h** is

1) mn 2) $m+n$ 3) m^n 4) n^m

3. A **polynomial equation** in x of **degree n** always has

1) n distinct roots2) n real roots3) **Exactly n roots**

4) Atmost one root

4. If α, β , and γ are the roots of $x^3 + px^2 + qx + r$, then $\sum \frac{1}{\alpha}$ is

1) $-\frac{q}{r}$ 2) $-\frac{p}{r}$ 3) $\frac{q}{r}$ 4) $-\frac{q}{p}$

5. According to the rational root theorem, which number is **not possible rational root** of $4x^7 + 2x^4 - 10x^3 - 5$?

1) -1

2) $\frac{5}{4}$ 3) $\frac{4}{5}$

4) 5

6. The polynomial $x^3 - kx^2 + 9x$ has **three real roots** if and only if, k satisfies

1) $|k| \leq 6$ 2) $k = 0$ 3) $|k| > 6$ 4) $|k| \geq 6$

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7. The number of real numbers in $[0, 2\pi]$ satisfying $\sin^4 x - 2\sin^2 x + 1$ is

- 1) 2 2) 4 3) 1 4) ∞

8. If $x^3 + 12x^2 + 10ax + 1999$ definitely has a positive root, if and only if

- 1) $a \geq 0$ 2) $a > 0$ 3) $a < 0$ 4) $a \leq 0$

9. The polynomial $x^3 + 2x + 3$ has

- 1) one negative and two real roots 2) one positive and two imaginary roots
3) three real roots 4) no solution

10. The number of positive roots of the polynomial $\sum_{j=0}^n nC_r (-1)^r x^r$ is

- 1) 0 2) n 3) $< n$ 4) r

Chapter – 4 Trigonometric Functions

1. The value of $\sin^{-1}(\cos x)$, $0 \leq x \leq \pi$ is

- 1) $\pi - x$ 2) $x - \frac{\pi}{2}$ 3) $\frac{\pi}{2} - x$ 4) $\pi - x$

2. If $\sin^{-1}x + \sin^{-1}y = \frac{2\pi}{3}$; then $\cos^{-1}x + \cos^{-1}y$ is equal to

- 1) $\frac{2\pi}{3}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{6}$ 4) π

3. $\sin^{-1}\frac{3}{5} - \cos^{-1}\frac{12}{13} + \sec^{-1}\frac{5}{3} - \csc^{-1}\frac{13}{12}$ is equal to

- 1) 2π 2) π 3) 0 4) $\tan^{-1}\frac{12}{65}$

4. If $\sin^{-1}x = 2\sin^{-1}a$ has a solution, then

- 1) $|\alpha| \leq \frac{1}{\sqrt{2}}$ 2) $|\alpha| \geq \frac{1}{\sqrt{2}}$ 3) $|\alpha| < \frac{1}{\sqrt{2}}$ 4) $|\alpha| > \frac{1}{\sqrt{2}}$

5. $\sin^{-1}(\cos x) = \frac{\pi}{2} - x$ is valid for

- 1) $-\pi \leq x \leq 0$ 2) $0 \leq x \leq \pi$ 3) $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$ 4) $-\frac{\pi}{4} \leq x \leq \frac{3\pi}{4}$

6. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \frac{3\pi}{2}$, the value of $x^{2017} + y^{2018} + z^{2019} - \frac{9}{x^{101} + y^{101} + z^{101}}$ is

- 1) 0 2) 1 3) 2 4) 3

7. If $\cot^{-1}x = \frac{2\pi}{5}$ for some $x \in R$, the value of $\tan^{-1}x$ is

- 1) $-\frac{\pi}{10}$ 2) $\frac{\pi}{5}$ 3) $\frac{\pi}{10}$ 4) $-\frac{\pi}{5}$

8. The domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$ is

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1) [1,2]

2) [-1,1]

3) [0,1]

4) [-1,0]

9. If $x = \frac{1}{5}$, the value of $\cos(\cos^{-1}x + 2\sin^{-1}x)$ is

1) $-\sqrt{\frac{24}{25}}$

2) $\sqrt{\frac{24}{25}}$

3) $\frac{1}{5}$

4) $-\frac{1}{5}$

10. $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right)$ is equal to

1) $\frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$

2) $\frac{1}{2}\sin^{-1}\left(\frac{3}{5}\right)$

3) $\frac{1}{2}\tan^{-1}\left(\frac{3}{5}\right)$

4) $\tan^{-1}\left(\frac{1}{2}\right)$

11. If the function $f(x) = \sin^{-1}(x^2 - 3)$, then x belongs to

1) [-1,1]

2) $[\sqrt{2}, 2]$

3) $[-2, -\sqrt{2}] \cup [\sqrt{2}, 2]$

4) $[-2, -\sqrt{2}] \cap [\sqrt{2}, 2]$

12. If $\cot^{-1}2$ and $\cot^{-1}3$ are two angles of a triangle, then the third angle is

1) $\frac{\pi}{4}$

2) $\frac{3\pi}{4}$

3) $\frac{\pi}{6}$

4) $\frac{\pi}{3}$

13. $\sin^{-1}\left(\tan\frac{\pi}{4}\right) - \sin^{-1}\left(\sqrt{\frac{3}{x}}\right) = \frac{\pi}{6}$. Then x is a root of the equation

1) $x^2 - x - 6 = 0$

2) $x^2 - x - 12 = 0$

3) $x^2 + x - 12 = 0$

4) $x^2 + x - 6 = 0$

14. $\sin^{-1}(2\cos^2x - 1) + \cos^{-1}(1 - 2\sin^2x) =$

1) $\frac{\pi}{2}$

2) $\frac{\pi}{3}$

3) $\frac{\pi}{4}$

4) $\frac{\pi}{6}$

15. If $\cot^{-1}(\sqrt{\sin\alpha}) + \tan^{-1}(\sqrt{\sin\alpha}) = u$, then $\cos 2u$ is equal to

1) $\tan^2\alpha$

2) 0

3) -1

4) $\tan 2\alpha$

16. If $|x| \leq 1$, then $2\tan^{-1}x - \sin^{-1}\frac{2x}{1+x^2}$ is equal to

1) $\tan^{-1}x$

2) $\sin^{-1}x$

3) 0

4) π

17. The equation $\tan^{-1}x - \cot^{-1}x = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ has

1) no solution

2) unique solution

3) two solution

4) infinite number of solution

18. If $\sin^{-1}x - \cot^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{2}$, then x is equal to

1) $\frac{1}{2}$

2) $\frac{1}{\sqrt{5}}$

3) $\frac{2}{\sqrt{5}}$

4) $\frac{\sqrt{3}}{2}$

19. If $\sin^{-1}\frac{x}{5} + \operatorname{cosec}^{-1}\frac{5}{4} = \frac{\pi}{2}$, then the value of x is

1) 4

2) 5

3) 2

4) 3

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20. $\sin(\tan^{-1}x)$, $|x| < 1$ is equal to

1) $\frac{x}{\sqrt{1-x^2}}$

2) $\frac{1}{\sqrt{1-x^2}}$

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

4) $\frac{x}{\sqrt{1+x^2}}$

Chapter -5 Two Dimensional Analytical Geometry

1. The equation of the **circle** passing through **(1,5) and (4,1)** and touching **y -axis** is

$$x^2 + y^2 - 5x - 6y + 9 + \lambda(4x + 3y - 19) = 0 \text{ where } \lambda \text{ is equal to}$$

1) $0, -\frac{40}{9}$

2) 0

3) $\frac{40}{9}$

4) $-\frac{40}{9}$

2. The **eccentricity of the hyperbola** whose **latus rectum is 8** and **conjugate axis is equal to half the distance between the foci** is

1) $\frac{4}{3}$

2) $\frac{4}{\sqrt{3}}$

3) $\frac{2}{\sqrt{3}}$

4) $\frac{3}{2}$

3. The **circle** $x^2 + y^2 = 4x + 8y + 5$ intersects the line $3x - 4y = m$ at two distinct points if

1) $15 < m < 65$

2) $35 < m < 85$

3) $-85 < m < -35$

4) $-35 < m < 15$

4. The **length of the diameter of the circle** which touches the **x - axis** at the point **(1,0)** and passes through the point **(2,3)**.

1) $\frac{6}{5}$

2) $\frac{5}{3}$

3) $\frac{10}{3}$

4) $\frac{3}{5}$

5. The radius of the circle $3x^2 + by^2 + 4bx - 6by + b^2 = 0$ is

1) 1

2) 3

3) $\sqrt{10}$

4) $\sqrt{11}$

6. The centre of the circle inscribed in a square formed by the lines $x^2 - 8x - 12 = 0$ and $y^2 - 14y + 15 = 0$ is

1) (4, 7)

2) (7, 4)

3) (9, 4)

4) (4, 9)

7. The **equation of the normal** to the circle $x^2 + y^2 - 2x - 2y + 1 = 0$ which is **parallel to the line** $2x + 4y = 3$ is

1) $x + 2y = 3$

2) $x + 2y + 3 = 0$

3) $2x + 4y + 3 = 0$

4) $x - 2y + 3 = 0$

8. If $P(x, y)$ be any point on $16x^2 + 25y^2 = 400$ with foci $F_1(3, 0)$ and $F_2(-3, 0)$ then $PF_1 + PF_2$ is

1) 8

2) 6

3) 10

4) 12

+2 MATHS**SAIVEERA ACADEMY****STUDY MATERIAL**

9. The radius of the circle passing through the point **(6,2)** two of whose diameter are

$$x + y = 6 \text{ and } x + 2y = 4 \text{ is}$$

- 1) 10 2) $2\sqrt{5}$ 3) 6 4) 4

10. The **area of quadrilateral** formed with **foci of the hyperbolas** $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1 \text{ is}$$

- 1) $4(a^2 + b^2)$ 2) $2(a^2 + b^2)$ 3) $a^2 + b^2$ 4) $\frac{1}{2}(a^2 + b^2)$

11. If the normals of the parabola $y^2 = 4x$ drawn at the end points of its latus rectum are tangents to the circle $(x - 3)^2 + (y + 2)^2 = r^2$, then the value of r^2 is

- 1) 2 2) 3 3) 1 4) 4

12. If $x + y = k$ is a **normal** to the parabola $y^2 = 12x$, then the value of k is

- 1) 3 2) -1 3) 1 4) 9

13. The ellipse $E_1 : \frac{x^2}{9} + \frac{y^2}{4} = 1$ is inscribed in a rectangle R whose sides are parallel to the coordinate axes. Another ellipse E_2 passing through the point **(0,4)** circumscribes the **rectangle R**. The eccentricity of the ellipse is

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

14. Tangents are drawn to the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ parallel to the straight line $2x - y = 1$.

One of the **points of contact of tangents** on the hyperbola is

- 1) $\left(\frac{9}{2\sqrt{2}}, \frac{-1}{\sqrt{2}}\right)$ 2) $\left(\frac{-9}{2\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ 3) $\left(\frac{9}{2\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ 4) $(3\sqrt{3}, -2\sqrt{2})$

15. The equation of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ having centre at **(0,3)** is

- 1) $x^2 + y^2 - 6y - 7 = 0$ 2) $x^2 + y^2 - 6y + 7 = 0$
3) $x^2 + y^2 - 6y - 5 = 0$ 4) $x^2 + y^2 - 6y + 5 = 0$

16. Let C be the circle with **centre at (1,1)** and **radius = 1**. If T is the circle centered at **(0,y)** passing through the origin and touching the circle C **externally**, then the radius of T is equal to

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

+2 MATHS**SAIVEERA ACADEMY****STUDY MATERIAL**

17. Consider an **ellipse** whose centre is of the origin and its major axis is along x-axis. If its **eccentricity is $\frac{3}{5}$** and the **distance between its foci is 6**, then the **area of the quadrilateral** inscribed in the ellipse with diagonals as major and minor axis of the ellipse is

- 1) 8 2) 32 3) 80 4) 40

18. **Area of the greatest rectangle** inscribed in the **ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$** is

- 1) **$2ab$** 2) ab 3) \sqrt{ab} 4) $\frac{a}{b}$

19. An ellipse has OB as semi minor axes, F and F' its foci and the angle FBF' is a right angle. Then the **eccentricity of the ellipse** is

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

20. The **eccentricity** of the **ellipse $(x - 3)^2 + (y - 4)^2 = \frac{y^2}{9}$** is

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

21. If the **two tangents** drawn from a point P to the parabola **$y^2 = 4x$** are at right angles then the **locus of P** is

- 1) $2x + 1 = 0$ 2) $x = -1$ 3) $2x - 1 = 0$ 4) $x = 1$

22. The **circle** passing through **$(1, 2)$** and touching the axis of x at **$(3, 0)$** passing through the point

- 1) $(-5, 2)$ 2) $(2, -5)$ 3) $(5, -2)$ 4) $(-2, 5)$

23. The locus of a point whose **distance** from **$(-2, 0)$** is **$\frac{2}{3}$ times its distance from the line $x = \frac{-9}{2}$** is

- 1) a parabola 2) a hyperbola 3) **an ellipse** 4) a circle

24. The values of m for which the line **$y = mx + 2\sqrt{5}$** touches the hyperbola **$16x^2 - 9y^2 = 144$** are the roots of **$x^2 - (a + b)x - 4 = 0$** then the value of **$(a + b)$** is

- 1) 2 2) 4 3) 0 4) -2

25. If the coordinates at one end of a diameter of the circle **$x^2 + y^2 - 8x - 4y + c = 0$** are **$(11, 2)$** , the coordinates of the other end are

- 1) $(-5, 2)$ 2) **$(-3, 2)$** 3) $(5, -2)$ 4) $(-2, 5)$

+2 MATHS**SAIVEERA ACADEMY****STUDY MATERIAL****Chapter – 6 Application Of Vector Algebra**

1. If \vec{a} and \vec{b} are parallel vectors, then $[\vec{a}, \vec{c}, \vec{b}]$ is equal to

- 1) 2 2) -1 3) 1 4) 0

2. If a vector $\vec{\alpha}$ lies in the plane of $\vec{\beta}$ and $\vec{\gamma}$, then

- 1) $[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 1$ 2) $[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = -1$ 3) $[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 0$ 4) $[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 2$

3. If $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} = 0$, then the value of $[\vec{a}, \vec{b}, \vec{c}]$ is

- 1) $|\vec{a}||\vec{b}||\vec{c}|$ 2) $\frac{1}{3}|\vec{a}||\vec{b}||\vec{c}|$ 3) 1 4) -1

4. If $\vec{a}, \vec{b}, \vec{c}$ are three unit vectors such that \vec{a} is perpendicular to \vec{b} , and is parallel to \vec{c} then $\vec{a} \times (\vec{b} \times \vec{c})$ is equal to

- 1) \vec{a} 2) \vec{b} 3) \vec{c} 4) $\vec{0}$

5. If $[\vec{a}, \vec{b}, \vec{c}] = 1$, then the value of $\frac{\vec{a} \cdot (\vec{b} \times \vec{c})}{(\vec{c} \times \vec{a}) \cdot \vec{b}} + \frac{\vec{b} \cdot (\vec{c} \times \vec{a})}{(\vec{a} \times \vec{b}) \cdot \vec{c}} + \frac{\vec{c} \cdot (\vec{a} \times \vec{b})}{(\vec{b} \times \vec{c}) \cdot \vec{a}}$ is

- 1) 1 2) -1 3) 2 4) 3

6. The volume of the parallelepiped with its edges represented by the vectors $\hat{i} + \hat{j}$, $\hat{i} + 2\hat{j}$, $\hat{i} + \hat{j} + \pi\hat{k}$ is

- 1) $\frac{\pi}{2}$ 2) $\frac{\pi}{3}$ 3) π 4) $\frac{\pi}{4}$

7. If \vec{a} and \vec{b} are unit vectors such that $[\vec{a}, \vec{b}, \vec{a} \times \vec{b}] = \frac{\pi}{4}$, then the angle between \vec{a} and \vec{b} is

- 1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

8. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + \hat{j}$, $\vec{c} = \hat{i}$ and $(\vec{a} \times \vec{b}) \times \vec{c} = \lambda\vec{a} + \mu\vec{b}$, then the value of $\lambda + \mu$ is

- 1) 0 2) 1 3) 6 4) 3

9. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar, non-zero vectors such that $[\vec{a}, \vec{b}, \vec{c}] = 3$, then $\{[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}]\}^2$ is equal to

- 1) 81 2) 9 3) 27 4) 18

10. If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors such that $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{\vec{b} + \vec{c}}{\sqrt{2}}$, then the angle between \vec{a} and \vec{b} is

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1) $\frac{\pi}{2}$

2) $\frac{3\pi}{4}$

3) $\frac{\pi}{4}$

4) π

11. If the volume of the parallelepiped with $\vec{a} \times \vec{b}$, $\vec{b} \times \vec{c}$, $\vec{c} \times \vec{a}$ as coterminal edges is 8 cubic units, then the **volume** of the parallelepiped with $(\vec{a} \times \vec{b}) \times (\vec{b} \times \vec{c})$, $(\vec{b} \times \vec{c}) \times (\vec{c} \times \vec{a})$ and $(\vec{c} \times \vec{a}) \times (\vec{a} \times \vec{b})$ as coterminal edges is,

1) 8 cubic units

2) 512 cubic units

3) **64 cubic units**

4) 24 cubic units

12. Consider the vectors $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ such that $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) = \vec{0}$. let P_1 and P_2 be the planes determined by the pairs of vectors \vec{a}, \vec{b} and \vec{c}, \vec{d} respectively. then the **angle** between P_1 and P_2 is

1) 0°

2) 45°

3) 60°

4) 90°

13. If $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \times \vec{b}) \times \vec{c}$, where $\vec{a}, \vec{b}, \vec{c}$ are any three vectors such that $\vec{b} \cdot \vec{c} \neq 0$ and $\vec{a} \cdot \vec{b} \neq 0$, then \vec{a} and \vec{c} are

1) perpendicular

2) **parallel**

3) inclined at an angle $\frac{\pi}{3}$

4) inclined at an angle $\frac{\pi}{6}$

14. If $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 5\hat{k}$, $\vec{c} = 3\hat{i} + 5\hat{j} - \hat{k}$, then a vector perpendicular to \vec{a} and lies in the plane containing \vec{b} and \vec{c} is

1) $-17\hat{i} + 21\hat{j} - 97\hat{k}$

2) $17\hat{i} + 21\hat{j} - 123\hat{k}$

3) $-17\hat{i} - 21\hat{j} + 97\hat{k}$

4) **$-17\hat{i} - 21\hat{j} - 97\hat{k}$**

15. The **angle** between the lines $\frac{x-2}{3} = \frac{y+1}{-2}$, $z = 2$ and $\frac{x-1}{1} = \frac{2y+3}{3} = \frac{z+5}{2}$ is

1) $\frac{\pi}{6}$

2) $\frac{\pi}{4}$

3) $\frac{\pi}{3}$

4) $\frac{\pi}{2}$

16. If the line $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z+2}{2}$ lies in the plane $x + 3y - \alpha z + \beta = 0$, then (α, β) is

1) $(-5, 5)$

2) **$(-6, 7)$**

3) $(5, -5)$

4) $(6, -7)$

17. The angle between the line $\vec{r} = (\hat{i} + 2\hat{j} - 3\hat{k}) + t(2\hat{i} + \hat{j} - 2\hat{k})$ and the plane $\vec{r} \cdot (\hat{i} + \hat{j}) + 4 = 0$ is

1) 0°

2) 30°

3) **45°**

4) 90°

18. The coordinates of the point where the line $\vec{r} = (6\hat{i} - \hat{j} - 3\hat{k}) + t(-\hat{i} + 4\hat{k})$ meets the plane $\vec{r} \cdot (\hat{i} + \hat{j} - \hat{k}) = 3$ are

1) $(2, 1, 0)$

2) $(7, -1, -7)$

3) $(1, 2, -6)$

4) **$(5, -1, 1)$**

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19. Distance from the origin to the plane $3x - 6y + 2z + 7 = 0$ is

- 1) 0 2) 1 3) 2 4) 3

20. The distance between the planes $x + 2y + 3z + 7 = 0$ and $2x + 4y + 6z + 7 = 0$ is

- 1) $\frac{\sqrt{7}}{2\sqrt{2}}$ 2) $\frac{7}{2}$ 3) $\frac{\sqrt{7}}{2}$ 4) $\frac{7}{2\sqrt{2}}$

21. If the direction cosines of a line are $\frac{1}{c}, \frac{1}{c}, \frac{1}{c}$, then

- 1) $c = \pm 3$ 2) $c = \pm\sqrt{3}$ 3) $c > 0$ 4) $0 < c < 1$

22. The vector equation $\vec{r} = (\hat{i} - 2\hat{j} - \hat{k}) + t(6\hat{i} - \hat{k})$ represents a straight line passing through the points

- 1) (0,6,-1) and (1,-2,-1) 2) (0,6,-1) and (-1,-4,-2)
3) (1,-2,-1) and (1,4,-2) 4) (1,-2,-1) and (0,-6,1)

23. If the distance of the point (1,1,1) from the origin is half of its distance from the plane $x + y + z + k = 0$, then the values of k are

- 1) ± 3 2) ± 6 3) $-3, 9$ 4) $3, -9$

24. If the planes $\vec{r} \cdot (2\hat{i} - \lambda\hat{j} + \hat{k}) = 3$ and $\vec{r} \cdot (4\hat{i} + \hat{j} + \mu\hat{k}) = 5$ are parallel, then the value of λ and μ are

- 1) $\frac{1}{2}, -2$ 2) $-\frac{1}{2}, 2$ 3) $-\frac{1}{2}, -2$ 4) $\frac{1}{2}, 2$

25. If the length of the perpendicular from the origin to the plane $2x + 3y + \lambda z = 1, \lambda > 0$ is $\frac{1}{5}$, then the value of λ is

- 1) $2\sqrt{3}$ 2) $3\sqrt{2}$ 3) 0 4) 1

Chapter – 7 Application Of Differential Calculus

1. The volume of a sphere is increasing in volume at the rate of $3\pi \text{ cm}^3/\text{sec}$. the rate of change of its radius when radius is $\frac{1}{2} \text{ cm}$.

- 1) 3 cm/s 2) 2 cm/s 3) 1 cm/s 4) $\frac{1}{2} \text{ cm/s}$

2. A balloon rises straight up at 10 m/s. An observer is 40 m away from the spot where the balloon left the ground. Find the rate of change of the balloon's angle of elevation in radian per second when the balloon is 30 metres above the ground.

+2 MATHS**SAIVEERA ACADEMY****STUDY MATERIAL**

- 1) $\frac{3}{25}$ radians/sec 2) $\frac{4}{25}$ radians/sec 3) $\frac{1}{5}$ radians/sec 4) $\frac{1}{3}$ radians/sec
3. The position of a particle moving along a horizontal line of any time t is given by $s(t) = 3t^2 - 2t - 8$. The time at which the particle is at rest is
- 1) $t = 0$ 2) $t = \frac{1}{3}$ 3) $t = 1$ 4) $t = 3$
4. A stone is thrown up vertically. The height it reaches at time t seconds is given by $x = 80t - 16t^2$. The stone reaches the **maximum height** in time t seconds is given by
- 1) 2 2) 2.5 3) 3 4) 3.5
5. Find the point on the curve $6y = x^3 + 2$ at which y -coordinate changes 8 times as fast as x -coordinate is
- 1) (4,11) 2) (4,-11) 3) (-4,11) 4) (-4,-11)
6. The **abscissa** of the point on the curve $f(x) = \sqrt{8 - 2x}$ at which the **slope** of the **tangent** is **-0.25** ?
- 1) -8 2) -4 3) -2 4) 0
7. The **slope** of the **line normal** to the curve $f(x) = 2 \cos 4x$ at $x = \frac{\pi}{12}$ is
- 1) $-4\sqrt{3}$ 2) -4 3) $\frac{\sqrt{3}}{12}$ 4) $4\sqrt{3}$
8. The **tangent** to the curve $y^2 - xy + 9 = 0$ is **vertical** when
- 1) $y = 0$ 2) $y = \pm\sqrt{3}$ 3) $y = \frac{1}{2}$ 4) $y = \pm 3$
9. **Angle** between $y^2 = x$ and $x^2 = y$ at the **origin** is
- 1) $\tan^{-1} \frac{3}{4}$ 2) $\tan^{-1} \left(\frac{4}{3}\right)$ 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{4}$
10. What is the value of the $\lim_{x \rightarrow 0} (\cot x - \frac{1}{x})$?
- 1) 0 2) 1 3) 2 4) ∞
11. The function $\sin^4 x + \cos^4 x$ is **increasing** in the interval
- 1) $\left[\frac{5\pi}{8}, \frac{3\pi}{4}\right]$ 2) $\left[\frac{\pi}{2}, \frac{5\pi}{8}\right]$ 3) $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$ 4) $\left[0, \frac{\pi}{4}\right]$
12. The number given by the **Rolle's theorem** for the function $x^3 - 3x^2, x \in [0, 3]$ is
- 1) 1 2) $\sqrt{2}$ 3) $\frac{3}{2}$ 4) 2
13. The number given by the **mean value theorem** for the function $\frac{1}{x}, x \in [1, 9]$ is

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- 1) 2 2) 2.5 3) 3 4) 3.5
14. The **minimum** value of the function $|3 - x| + 9$ is
- 1) 0 2) 3 3) 6 4) 9
15. The **maximum slope** of the **tangent** to the curve $y = e^x \sin x, x \in [0, 2\pi]$ is at
- 1) $x = \frac{\pi}{4}$ 2) $x = \frac{\pi}{2}$ 3) $x = \pi$ 4) $x = \frac{3\pi}{2}$
16. The **maximum** value of the function $x^2 e^{-2x}, x > 0$ is
- 1) $\frac{1}{e}$ 2) $\frac{1}{2e}$ 3) $\frac{1}{e^2}$ 4) $\frac{4}{e^4}$
17. One of the **closest points** on the curve $x^2 - y^2 = 4$ to the point **(6,0)** is
- 1) (2,0) 2) $(\sqrt{5}, 1)$ 3) $(3, \sqrt{5})$ 4) $(\sqrt{13}, -\sqrt{3})$
18. The **maximum product** of **two positive numbers**, when their **sum of the squares is 200**, is
- 1) **100** 2) $25\sqrt{7}$ 3) 28 4) $24\sqrt{14}$
19. The curve $y = ax^4 + bx^2$ with $ab > 0$
- 1) has no horizontal tangent 2) is concave up
- 3) is concave down 4) **has no points of inflection**
20. The point of inflection of the curve $y = (x - 1)^3$ is
- 1) (0,0) 2) (0,1) 3) (1,0) 4) (1,1)

Chapter – 8 Differentials and Partial Derivatives

1. A **circular** template has a radius of **10 cm**. The measurement of **radius** has an approximate **error of 0.02 cm**. Then the **percentage error** in calculating **area of this template** is
- 1) 0.2% 2) **0.4%** 3) 0.04% 4) 0.08%
2. The percentage error of **fifth root of 31** is approximately how many times the **percentage error in 31**?
- 1) $\frac{1}{31}$ 2) $\frac{1}{5}$ 3) 5 4) 31
3. If $u(x, y) = e^{x^2+y^2}$, then $\frac{\partial u}{\partial x}$ is equal to
- 1) $e^{x^2+y^2}$ 2) **$2xu$** 3) x^2u 4) y^2u

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4. If $(x, y) = \log(e^x + e^y)$, then $\frac{\partial v}{\partial x} + \frac{\partial v}{\partial y}$ is equal to

- 1) $e^x + e^y$ 2) $\frac{1}{e^x + e^y}$ 3) 2 4) 1

5. If $w(x, y) = x^y, x > 0$, then $\frac{\partial w}{\partial x}$ is equal to

- 1) $x^y \log x$ 2) $y \log x$ 3) yx^{y-1} 4) $x \log y$

6. If $f(x, y) = e^{xy}$, then $\frac{\partial^2 f}{\partial x \partial y}$ is equal to

- 1) xye^{xy} 2) $(1 + xy)e^{xy}$ 3) $(1 + y)e^{xy}$ 4) $(1 + x)e^{xy}$

7. If we measure the **side of a cube** to be **4 cm** with an **error of 0.1 cm**, then the error in our calculation of the **volume** is

- 1) 0.4 cu.cm 2) 0.45 cu.cm 3) 2 cu.cm 4) **4.8 cu.cm**

8. The change in the surface area **S** = **6x²** of a cube when the **edge length** varies from **x₀ to x₀ + dx** is

- 1) $12x_0 + dx$ 2) **$12x_0 dx$** 3) $6x_0 dx$ 4) $6x_0 + dx$

9. The approximate change in the **volume V** of a **cube** of side **x metres** caused by **increasing the side by 1%** is

- 1) $0.3 x dx m^3$ 2) $0.03 x m^3$ 3) **$0.03 x^2 m^3$** 4) $0.03 x^3 m^3$

10. If $g(x, y) = 3x^2 - 5y + 2y^2, x(t) = e^t$ and $y(t) = \cos t$, then $\frac{dg}{dt}$ is equal to

- 1) **$6e^{2t} + 5 \sin t - 4 \cos t \sin t$** 2) $6e^{2t} - 5 \sin t + 4 \cos t \sin t$
3) $3e^{2t} + 5 \sin t + 4 \cos t \sin t$ 4) $3e^{2t} - 5 \sin t + 4 \cos t \sin t$

11. If $(x) = \frac{x}{x+1}$, then its **differential** is given by

- 1) $\frac{-1}{(x+1)^2} dx$ 2) $\frac{1}{(x+1)^2} dx$ 3) $\frac{1}{x+1} dx$ 4) $\frac{-1}{x+1} dx$

12. If $u(x, y) = x^2 + 3xy + y - 2019$, then $\frac{\partial u}{\partial x} |_{(4, -5)}$ is equal to

- 1) -4 2) -3 3) **-7** 4) 13

13. **Linear approximation** for $g(x) = \cos x$ at $x = \frac{\pi}{2}$ is

- 1) $x + \frac{\pi}{2}$ 2) $-x + \frac{\pi}{2}$ 3) $x - \frac{\pi}{2}$ 4) $-x - \frac{\pi}{2}$

14. If $w(x, y, z) = x^2(y - z) + y^2(z - x) + z^2(x - y)$, then $\frac{\partial w}{\partial x} + \frac{\partial w}{\partial y} + \frac{\partial w}{\partial z}$ is

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1) $xy + yz + zx$

2) $x(y + z)$

3) $y(z + x)$

4) 0

15. If $f(x, y, z) = xy + yz + zx$, then $f_x - f_z$ is equal to

1) $z - x$

2) $y - z$

3) $x - z$

4) $y - x$

Chapter – 9 Application of Integration

1. The value of $\int_0^{\frac{2}{3}} \frac{dx}{\sqrt{4-9x^2}}$ is

1) $\frac{\pi}{6}$

2) $\frac{\pi}{2}$

3) $\frac{\pi}{4}$

4) π

2. The value of $\int_{-1}^2 |x| dx$ is

1) $\frac{1}{2}$

2) $\frac{3}{2}$

3) $\frac{5}{2}$

4) $\frac{7}{2}$

3. For any value of $n \in \mathbb{Z}$, $\int_0^{\pi} e^{\cos^2 x} \cos^3[(2n+1)x] dx$ is

1) $\frac{\pi}{2}$

2) π

3) 0

4) 2

4. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^2 x \cos x dx$ is

1) $\frac{3}{2}$

2) $\frac{1}{2}$

3) 0

4) $\frac{2}{3}$

5. The value of $\int_{-\frac{4}{3}}^4 \left[\tan^{-1} \left(\frac{x^2}{x^4+1} \right) + \tan^{-1} \left(\frac{x^4+1}{x^2} \right) \right] dx$ is

1) π

2) 2π

3) 3π

4) 4π

6. The value of $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \left(\frac{2x^7-3x^5+7x^3-x+1}{\cos^2 x} \right) dx$ is

1) 4

2) 3

3) 2

4) 0

7. If $f(x) = \int_0^x t \cos t dt$, then $\frac{df}{dx} =$

1) $\cos x - x \sin x$

2) $\sin x + x \cos x$

3) $x \cos x$

4) $x \sin x$

8. The area between $y^2 = 4x$ and its latus rectum is

1) $\frac{2}{3}$

2) $\frac{4}{3}$

3) $\frac{8}{3}$

4) $\frac{5}{3}$

9. The value of $\int_0^1 x(1-x)^{99} dx$ is

1) $\frac{1}{11000}$

2) $\frac{1}{10100}$

3) $\frac{1}{10010}$

4) $\frac{1}{10001}$

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10. The value of $\int_0^{\pi} \frac{dx}{1+5\cos x}$ is

- 1) $\frac{\pi}{2}$ 2) π 3) $\frac{3\pi}{2}$ 4) 2π

11. If $\frac{\Gamma(n+2)}{\Gamma(n)} = 90$ then n is

- 1) 10 2) 5 3) 8 4) 9

12. The value of $\int_0^{\frac{\pi}{6}} \cos^3 3x \, dx$ is

- 1) $\frac{2}{3}$ 2) $\frac{2}{9}$ 3) $\frac{1}{9}$ 4) $\frac{1}{3}$

13. The value of $\int_0^{\pi} \sin^4 x \, dx$ is

- 1) $\frac{3\pi}{10}$ 2) $\frac{3\pi}{8}$ 3) $\frac{3\pi}{4}$ 4) $\frac{3\pi}{2}$

14. The value of $\int_0^{\infty} e^{-3x} x^2 \, dx$ is

- 1) $\frac{7}{27}$ 2) $\frac{5}{27}$ 3) $\frac{4}{27}$ 4) $\frac{2}{27}$

15. If $\int_0^a \frac{1}{4+x^2} \, dx = \frac{\pi}{8}$ then a is

- 1) 4 2) 1 3) 3 4) 2

16. The volume of solid of revolution of the region bounded by $y^2 = x(a-x)$ about x -axis is

- 1) πa^3 2) $\frac{\pi a^3}{4}$ 3) $\frac{\pi a^3}{5}$ 4) $\frac{\pi a^3}{6}$

17. If $f(x) = \int_1^x \frac{e^{\sin u}}{u} \, du, x > 1$ and $\int_1^3 \frac{e^{\sin x^2}}{x} \, dx = \frac{1}{2}[f(a) - f(1)]$, then one of the possible value of a is

- 1) 3 2) 6 3) 9 4) 5

18. The value of $\int_0^1 (\sin^{-1} x)^2 \, dx$ is

- 1) $\frac{\pi^2}{4} - 1$ 2) $\frac{\pi^2}{4} + 2$ 3) $\frac{\pi^2}{4} + 1$ 4) $\frac{\pi^2}{4} - 2$

19. The value of $\int_0^a (\sqrt{a^2 - x^2})^3 \, dx$ is

- 1) $\frac{\pi a^3}{16}$ 2) $\frac{3\pi a^4}{16}$ 3) $\frac{3\pi a^2}{8}$ 4) $\frac{3\pi a^4}{8}$

20. If $\int_0^x f(t) \, dt = x + \int_x^1 t f(t) \, dt$, then the value of $f(1)$ is

- 1) $\frac{1}{2}$ 2) 2 3) 1 4) $\frac{3}{4}$

Chapter – 10 Ordinary Differential Equation

- The **order** and **degree** of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{\frac{1}{3}} + x^{\frac{1}{4}} = 0$ are respectively
 1) 2,3 2) 3,3 3) 2,6 4) 2,4
- The differential equation representing the family of curves $y = A\cos(x + B)$, where A and B are parameters, is
 1) $\frac{d^2y}{dx^2} - y = 0$ 2) $\frac{d^2y}{dx^2} + y = 0$ 3) $\frac{d^2y}{dx^2} = 0$ 4) $\frac{d^2x}{dy^2} = 0$
- The **order** and **degree** of the differential equation $\sqrt{\sin x}(dx + dy) = \sqrt{\cos x}(dx - dy)$ is
 1) 1,2 2) 2,2 3) 1,1 4) 2,1
- The **order** of the differential equation of all circles with centre at (h, k) and radius 'a' is
 1) 2 2) 3 3) 4 4) 1
- The differential equation of the family of curves $y = Ae^x + Be^{-x}$, where A and B are arbitrary constants is
 1) $\frac{d^2y}{dx^2} + y = 0$ 2) $\frac{d^2y}{dx^2} - y = 0$ 3) $\frac{dy}{dx} + y = 0$ 4) $\frac{dy}{dx} - y = 0$
- The **general solution** of the differential equation $\frac{dy}{dx} = \frac{y}{x}$ is
 1) $xy = k$ 2) $y = k \log x$ 3) $y = kx$ 4) $\log y = kx$
- The **solution** of the differential equation $2x \frac{dy}{dx} - y = 3$ represents
 1) straight line 2) circles 3) parabola 4) ellipse
- The solution of $\frac{dy}{dx} + p(x)y = 0$ is
 1) $y = ce^{\int p dx}$ 2) $y = ce^{-\int p dx}$ 3) $x = ce^{-\int p dy}$ 4) $x = ce^{\int p dy}$
- The **integrating factor** of the differential equation $\frac{dy}{dx} + y = \frac{1+y}{\lambda}$ is
 1) $\frac{x}{e^\lambda}$ 2) $\frac{e^\lambda}{x}$ 3) λe^x 4) e^x
- The **integrating factor** of the differential equation $\frac{dy}{dx} + p(x)y = Q(x)$ is x , then $P(x)$
 1) x 2) $\frac{x^2}{2}$ 3) $\frac{1}{x}$ 4) $\frac{1}{x^2}$
- The **degree** of the differential equation $y(x) = 1 + \frac{dy}{dx} + \frac{1}{1.2} \left(\frac{dy}{dx}\right)^2 + \frac{1}{1.2.3} \left(\frac{dy}{dx}\right)^3 + \dots$ is

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1) 2

2) 3

3) 1

4) 4

12. If p and q are the order and degree of the differential equation $y \frac{dy}{dx} + x^3 \left(\frac{d^2y}{dx^2} \right) + xy = \cos x$, when

1) $p < q$ 2) $p = q$ 3) $p > q$ 4) p exists and q does not exist

13. The solution of the differential equation $\frac{dy}{dx} + \frac{1}{\sqrt{1-x^2}} = 0$ is

1) $y + \sin^{-1} x = c$ 2) $x + \sin^{-1} y = 0$ 3) $y^2 + 2 \sin^{-1} x = C$ 4) $x^2 + 2 \sin^{-1} y = 0$

14. The solution of the differential equation $\frac{dy}{dx} = 2xy$ is

1) $y = Ce^{x^2}$ 2) $y = 2x^2 + C$ 3) $y = Ce^{-x^2} + C$ 4) $y = x^2 + C$

15. The general solution of the differential equation $\log \left(\frac{dy}{dx} \right) = x + y$ is

1) $e^x + e^y = C$ 2) $e^x + e^{-y} = C$ 3) $e^{-x} + e^y = C$ 4) $e^{-x} + e^{-y} = C$

16. The solution of $\frac{dy}{dx} = 2^{y-x}$ is

1) $2^x + 2^y = C$ 2) $2^x - 2^y = C$ 3) $\frac{1}{2^x} + \frac{1}{2^y} = C$ 4) $x + y = C$

17. The solution of the differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{\phi\left(\frac{y}{x}\right)}{\phi\left(\frac{y}{x}\right)}$ is

1) $x\phi\left(\frac{y}{x}\right) = k$ 2) $\phi\left(\frac{y}{x}\right) = kx$ 3) $y\phi\left(\frac{y}{x}\right) = k$ 4) $\phi\left(\frac{y}{x}\right) = ky$

18. If $\sin x$ is the integrating factor of the linear differential equation $\frac{dy}{dx} + Py = Q$, then P is

1) $\log \sin x$ 2) $\cos x$ 3) $\tan x$ 4) $\cot x$

19. The number of arbitrary constants in the general solutions of order n and $n + 1$ are respectively

1) $n - 1, n$ 2) $n, n + 1$ 3) $n + 1, n + 2$ 4) $n + 1, n$

20. The number of arbitrary constants in the particular solution of a differential equation of third order is

1) 3

2) 2

3) 1

4) 0

21. Integrating factor of the differential equation $\frac{dy}{dx} = \frac{x+y+1}{x+1}$ is

1) $\frac{1}{x+1}$ 2) $x + 1$ 3) $\frac{1}{\sqrt{x+1}}$ 4) $\sqrt{x+1}$

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22. The **population** P in any year t is such that the **rate of increase in the population** is proportional to the population. Then

- 1) $P = Ce^{kt}$ 2) $P = Ce^{-kt}$ 3) $P = Ckt$ 4) $P = C$

23. P is the amount of certain substance left in after time t . If the **rate of evaporation** of the substance is proportional to the amount remaining, then

- 1) $P = Ce^{kt}$ 2) $P = Ce^{-kt}$ 3) $P = Ckt$ 4) $Pt = C$

24. If the solution of the differential equation $\frac{dy}{dx} = \frac{ax+3}{2y+f}$ represents a circle, then the value of a is

- 1) 2 2) -2 3) 1 4) -1

25. The slope at any point of a curve $y = f(x)$ is given by $\frac{dy}{dx} = 3x^2$ and it passes through $(-1, 1)$. Then the equation of the curve is

- 1) $y = x^3 + 2$ 2) $y = 3x^2 + 4$ 3) $y = 3x^3 + 4$ 4) $y = x^3 + 5$

Chapter -- 11 Probability Distributions

1. Let X be random variable with probability density function

$$f(x) = \begin{cases} \frac{2}{x^3}, & x \geq 1 \\ 0, & x < 1 \end{cases}$$

Which of the following statement is correct?

- (1) both mean and variance exist (2) **mean exists but variance does not exist**
 (3) both mean and variance do not exist (4) variance exists but Mean does not exist.

2. A rod of length $2l$ is broken into two pieces at random. The probability density function of the shorter of the two pieces is

$$f(x) = \begin{cases} \frac{1}{l}, & 0 < x < l \\ 0, & l \leq x < 2l \end{cases}$$

The mean and variance of the shorter of the two pieces are respectively

- 1) $\frac{l}{2}, \frac{l^2}{3}$ 2) $\frac{l}{2}, \frac{l^2}{6}$ 3) $l, \frac{l^2}{12}$ 4) $\frac{l}{2}, \frac{l^2}{12}$

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3. Consider a game where the player tosses a **six-sided fair die**. If the face that comes up is **6**, the player **wins 36 rupees**, otherwise he **loses k^2 rupees**, where k is the face that comes up $k = \{1, 2, 3, 4, 5\}$.

The expected **amount to win** at this game in rupees is

- 1) $\frac{19}{6}$ 2) $-\frac{19}{6}$ 3) $\frac{3}{2}$ 4) $-\frac{3}{2}$

4. A pair of dice numbered **1, 2, 3, 4, 5, 6** of a six-sided die and **1, 2, 3, 4** of a four-sided die is rolled and the **sum** is determined. Let the random variable X denote this sum. Then the number of elements in the **inverse image of 7** is

- 1) 1 2) 2 3) 3 4) 4

5. A random variable X has **binomial distribution** with $n = 25$ and $p = 0.8$ then standard deviation of X is

- 1) 6 2) 4 3) 3 4) 2

6. Let X represent the **difference between the number of heads and the number of tails** obtained when a coin is tossed n times. Then the possible values of X are

- 1) $i+2n, i = 0, 1, 2, \dots, n$ 2) $2i-n, i = 0, 1, 2, \dots, n$
 3) $n-i, i = 0, 1, 2, \dots, n$ 4) $2i+2n, i = 0, 1, 2, \dots, n$

7. If the function $f(x) = \frac{1}{12}$ for $a < x < b$, represents a probability density function of a continuous random variable X , then which of the following cannot be the value of a and b ?

- 1) 0 and 12 2) 5 and 17 3) 7 and 19 4) 16 and 24

8. **Four buses carrying 160 students** from the same school arrive at a football stadium. The buses carry, respectively, **42, 36, 34, and 48 students**. One of the students is randomly selected. Let X denote the number of students that were on the bus carrying the randomly selected student. One of the 4 bus drivers is also randomly selected. Let Y denote the number of students on that bus. Then $E[X]$ and $E[Y]$ respectively are

- 1) 50, 40 2) 40, 50 3) 40.75, 40 4) 41, 41

9. **Two coins** are to be flipped. The **first coin** will land on heads with probability **0.6**, the **second** with Probability **0.5**. Assume that the results of the flips are independent, and let X equal the total number of heads that result. The value of $E[X]$ is

- 1) 0.11 2) 1.1 3) 11 4) 1

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10. On a multiple-choice exam with **3 possible destructives** for each of the **5** questions, the probability that a student will get **4 or more correct answers** just by guessing is

- 1) $\frac{11}{243}$ 2) $\frac{3}{8}$ 3) $\frac{1}{243}$ 4) $\frac{5}{243}$

11. If $P[X = 0] = 1 - P[X = 1]$. If $E[X] = 3 \text{ Var}(X)$, then $P[X = 0]$.

- 1) $\frac{2}{3}$ 2) $\frac{2}{5}$ 3) $\frac{1}{5}$ 4) $\frac{1}{3}$

12. If X is a binomial random variable with **expected value 6 and variance 2.4**, then $P[X = 5]$ is

- 1) $\binom{10}{5} \left(\frac{3}{5}\right)^6 \left(\frac{2}{5}\right)^4$ 2) $\binom{10}{5} \left(\frac{3}{5}\right)^5$ 3) $\binom{10}{5} \left(\frac{3}{5}\right)^4 \left(\frac{2}{5}\right)^6$ 4) $\binom{10}{5} \left(\frac{3}{5}\right)^5 \left(\frac{2}{5}\right)^5$

13. The random variable X has the probability density function

$$f(x) = \begin{cases} ax + b, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases} \text{ and } E(X) = \frac{7}{12}, \text{ then } a \text{ and } b \text{ are respectively}$$

- 1) **1 and $\frac{1}{2}$** 2) $\frac{1}{2}$ and 1 3) 2 and 1 4) 1 and 2

14. Suppose that X takes on one of the values **0,1, and 2**. If for some constant k , $P(X = i) = kP(X = i - 1)$ for $i = 1, 2$ and $P(X = 0) = \frac{1}{7}$. Then the value of k is

- 1) 1 2) 2 3) 3 4) 4

15. Which of the following is a **discrete random variable**?

- I. The number of cars crossing a particular signal in a day.
 II. The number of customers in a queue to buy train tickets at a moment.
 III. The time taken to complete a telephone call.

- 1) **I and II** 2) II only 3) III only 4) II and III

16. If $f(x) = \begin{cases} 2x, & 0 \leq x \leq a \\ 0, & \text{otherwise} \end{cases}$ is a probability density function of a random variable, then the value of a is

- 1) 1 2) 2 3) 3 4) 4

17. The probability function of a random variable is defined as:

x	-2	-1	0	1	2
$f(x)$	k	$2k$	$3k$	$4k$	$5k$

Then $E(X)$ is equal to :

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1) $\frac{1}{15}$

2) $\frac{1}{10}$

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

4) $\frac{2}{3}$

18. Let X have a Bernoulli distribution with **mean 0.4**, then the variance of $(2X - 3)$ is

1) 0.24

2) 0.48

3) 0.6

4) **0.96**

19. If in **6 trials**, X is a binomial variate which follows the relation **$9P(X = 4) = P(X = 2)$** , then the probability of success is

1) 0.125

2) **0.25**

3) 0.375

4) 0.75

20. A computer salesperson knows from his past experience that he sells computers to **one in every twenty customers** who enter the showroom. What is the probability that he will sell a computer to **exactly two of the next three customers**?

1) $\frac{57}{20^3}$

2) $\frac{57}{20^2}$

3) $\frac{19^3}{20^3}$

4) $\frac{57}{20}$

Chapter – 12 Discrete Mathematics

1) A **binary operation** on a set S is a function from

1) $S \rightarrow S$

2) $(S \times S) \rightarrow S$

3) $S \rightarrow (S \times S)$

4) $(S \times S) \rightarrow (S \times S)$

2. **Subtraction** is **not a binary operation** in

1) \mathbb{R}

2) \mathbb{Z}

3) \mathbb{N}

4) \mathbb{Q}

3. Which one of the following is a **binary operation** on \mathbb{N} ?

1) Subtraction

2) **Multiplication**

3) Division

4) All the above

4. In the set \mathbb{R} of real numbers ' $*$ ' is defined as follows. Which one of the following is **not a binary operation** on \mathbb{R} ?

1) $a * b = \min(a, b)$

2) $a * b = \max(a, b)$

3) $a * b = a$

4) **$a * b = a^b$**

5. The operation $*$ defined by $a * b = \frac{ab}{7}$ is not a binary operation on

1) \mathbb{Q}^+

2) \mathbb{Z}

3) \mathbb{R}

4) \mathbb{C}

6. In the set \mathbb{Q} define $a \odot b = a + b + ab$. For what value of y , $3 \odot (y \odot 5) = 7$?

1) $y = \frac{2}{3}$

2) $y = \frac{-2}{3}$

3) $y = \frac{-3}{2}$

4) $y = 4$

7. If $a * b = \sqrt{a^2 + b^2}$ on the real numbers then $*$ is

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- 1) commutative but not associative 2) associative but not commutative
 3) **both commutative and associative** 4) neither commutative nor associative

8. Which one of the following statements has the **truth value T**?

- 1) $\sin x$ is an even function. 2) Every square matrix is non-singular
 3) The product of complex number and its conjugate is purely imaginary
 4) **$\sqrt{5}$ is an irrational number**

9. Which one of the following statements has truth value F?

- 1) Chennai is in India or $\sqrt{2}$ is an integer
 2) Chennai is in India or $\sqrt{2}$ is an irrational number
 3) **Chennai is in China or $\sqrt{2}$ is an integer**
 4) Chennai is in China or $\sqrt{2}$ is an irrational number

10. If a compound statement involves **3 simple statements**, then the **number of rows** in the truth table is

- 1) 9 2) **8** 3) 6 4) 3

11. Which one is the **inverse** of the statement $(p \vee q) \rightarrow (p \wedge q)$?

- 1) $(p \wedge q) \rightarrow (p \vee q)$ 2) $\sim (p \vee q) \rightarrow (p \wedge q)$
 3) $(\sim p \vee \sim q) \rightarrow (\sim p \wedge \sim q)$ 4) $(\sim p \wedge \sim q) \rightarrow (\sim p \vee \sim q)$

12. Which one is the **contrapositive** of the statement $(p \vee q) \rightarrow r$?

- 1) $\sim r \rightarrow (\sim p \wedge \sim q)$ 2) $\sim r \rightarrow (p \vee q)$ 3) $r \rightarrow (p \wedge q)$ 4) $p \rightarrow (q \vee r)$

13. The truth table for $(p \wedge q) \vee \sim q$ is given below

p	q	$(p \wedge q) \vee \sim q$
T	T	(a)
T	F	(b)
F	T	(c)
F	F	(d)

Which one of the following is true?

- (a) (b) (c) (d)
 (1) T T T T

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(2)	T	F	T	T
(3)	T	T	F	T
(4)	T	F	F	F

14. In the **last column** of the truth table for $\sim (p \vee \sim q)$ the number of **final outcomes of the truth value 'F'** are

- 1) 1 2) 2 3) 3 4) 4

15. Which one of the following is **incorrect**? For any **two propositions p and q** , we have

- 1) $\sim (p \vee q) \equiv \sim p \wedge \sim q$ 2) $\sim (p \wedge q) \equiv \sim p \vee \sim q$
 3) $\sim (p \vee q) \equiv \sim p \vee \sim q$ 4) $\sim (\sim p) \equiv p$

16.

p	q	$(p \wedge q) \rightarrow \sim p$
T	T	(a)
T	F	(b)
F	T	(c)
F	F	(d)

Which one of the following is correct for the truth value of $(p \wedge q) \rightarrow \sim p$?

- | | | | | |
|-----|-----|-----|-----|-----|
| | (a) | (b) | (c) | (d) |
| (1) | T | T | T | T |
| (2) | F | T | T | T |
| (3) | F | F | T | T |
| (4) | T | T | T | F |

17. The **dual** of $\sim (p \vee q) \vee [p \vee (p \wedge \sim r)]$ is

- 1) $\sim (p \wedge q) \wedge [p \vee (p \wedge \sim r)]$ 2) $(p \wedge q) \wedge [p \wedge (p \vee \sim r)]$
 3) $\sim (p \wedge q) \wedge [p \wedge (p \wedge r)]$ 4) $\sim (p \wedge q) \wedge [p \wedge (p \vee \sim r)]$

18. The proposition $p \wedge (\sim p \vee q)$ is

- 1) a tautology 2) a contradiction

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19. Determine the truth value of each of the following statements:

(a) $4+2=5$ and $6+3=9$

(b) $3+2=5$ and $6+1=7$

(c) $4+5=9$ and $1+2=4$

(d) $3+2=5$ and $4+7=11$

	(a)	(b)	(c)	(d)
(1)	F	T	F	T
(2)	T	F	T	F
(3)	T	T	F	F
(4)	F	F	T	T

20. Which one of the following is **not true**?

1) Negation of a negation of a statement is the statement itself.

2) If the last column of the truth table contains only T then it is a tautology.

3) If the last column of its truth table contains only F then it is a contradiction

4) If p and q are any two statements then $p \leftrightarrow q$ is a tautology.



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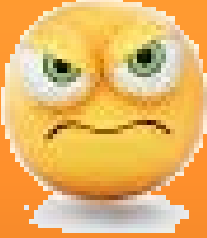


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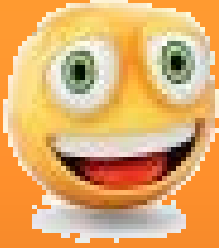


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