

# 30 Most Important Questions (Made with by Sagar Sangam)

Deep Analysis of Repeated Exam Patterns | Created for **DiplomaWallah**

## GROUP A: ALGEBRA & MATRICES (Unit 1 to 4)

01. If  $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ , prove that  $A^2 + 2A - 11I = 0$ . 95% Match

02. Resolve the following into **Partial Fractions**:  $\frac{x^2+1}{(x-1)(x-2)(x-3)}$ .

03. Prove using properties of determinants:

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

04. Solve the system using **Cramer's Rule**:  $x + y + z = 6$ ,  $2x - y + z = 3$ ,  $x - 2y + 3z = 6$ . Fix  
10M

05. Find the **Adjoint and Inverse** of the matrix:  $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & 5 \end{bmatrix}$ .

06. Find the Eigenvalues of the matrix  $A = \begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$ .

07. Find  $x$  if the matrix  $\begin{bmatrix} x & 2 \\ 8 & x \end{bmatrix}$  is a **Singular Matrix**.

08. Expand the determinant  $\Delta = \begin{vmatrix} \sin \alpha & \cos \alpha \\ -\cos \alpha & \sin \alpha \end{vmatrix}$ .

## GROUP B: COORDINATE GEOMETRY (Unit 5 to 7)

09. Find the angle between the lines  $2x - y + 3 = 0$  and  $x + y - 2 = 0$ .

10. Find the equation of a line passing through  $(2, 3)$  and **Parallel** to  $3x - 4y + 5 = 0$ . Short

11. Find the equation of a line **Perpendicular** to  $x - 2y + 3 = 0$  passing through  $(1, -2)$ .

12. Find the distance between parallel lines  $3x + 4y - 9 = 0$  and  $3x + 4y + 1 = 0$ .
- 
13. Find the coordinates of the **Centroid** of a triangle with vertices  $(1, 2)$ ,  $(3, 4)$ ,  $(5, 6)$ .
- 
14. Find the distance of the point  $(4, 5)$  from the line  $3x - 4y + 12 = 0$ .
- 
15. Find the area of a triangle whose vertices are  $(1, 2)$ ,  $(3, 4)$  and  $(7, 5)$ .
- 

### GROUP C: TRIGONOMETRY (Unit 8 to 10)

16. Find the value of  $\sin 15^\circ$  and  $\tan 75^\circ$  using compound angle formulas.
- 
17. Prove that:  $\frac{\sin 2\theta}{1 + \cos 2\theta} = \tan \theta$ .
- 
18. If  $A + B + C = \pi$ , prove:  $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$ . **Long Proof**
- 
19. Show that:  $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$ .
- 
20. Solve:  $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{4}$ .
- 
21. Evaluate  $\sin(150^\circ) + \cos(300^\circ)$  using the **ASTC Rule**.
- 
22. In any triangle  $ABC$ , prove:  $a = b \cos C + c \cos B$ .
- 

### GROUP D: CALCULUS (Unit 11 to 13)

23. Find the derivative of  $\sin x$  using the **First Principle**. **Conceptual**
- 
24. Differentiate  $y = (\sin x)^{\log x}$  with respect to  $x$ .
- 
25. If  $y = a \cos(\log x) + b \sin(\log x)$ , prove that  $x^2 y_2 + x y_1 + y = 0$ .
- 
26. Find the **Maxima and Minima** of the function:  $f(x) = 2x^3 - 21x^2 + 36x - 20$ . **Repeat Pattern**
- 
27. Evaluate the integral:  $\int x^2 e^x dx$  using **Integration by Parts**.
- 
28. Evaluate:  $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$ . **Property Based**
- 
29. Find the **Area** bounded by the circle  $x^2 + y^2 = a^2$  using integration.
- 
30. Find the equation of the **Tangent and Normal** to the curve  $y = x^2 - 4x + 3$  at point  $(4, 3)$ .
-