

## Sample Paper Of Mathematics For CBSE Board

### General Instruction:-

- 1) All questions are compulsory.
- 2) The question paper consists of 30 questions divided into three sections. Section A comprises of 10 questions of one mark each, section B comprises of 15 questions of four marks each and section C comprises of 5 questions of six marks each.
- 3) All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.

### Section - A

- Q 1. What is the principal value of  $\cos^{-1}(\cos(2\pi/3)) + \sin^{-1}(\sin(2\pi/3))$ ? [1]
- Q 2. For what value of x, the following matrix is singular?  $\begin{bmatrix} 5-x & x+1 \\ 2 & 4 \end{bmatrix}$ . [1]
- Q 3. Give an example of a relation which is reflexive and transitive but not Symmetric. [1]
- Q 4. If  $x = a \cos t$  and  $y = a \sin t$ . Find  $dy/dx$ . [1]
- Q 5. If  $f: \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 3x + 2$ , define  $f \circ f(x)$ . [1]
- Q 6. If  $|\begin{bmatrix} x & x+1 \\ 3 & 4 \end{bmatrix}| = |\begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}|$ , write the positive value of x. [1]
- Q 7. The radius of a circle is increasing at the rate of 0.7 cm/s. what is the rate of increasing of its circumference? [1]
- Q 8. Find the value of x for which is a unit vector. [1]
- Q 9. Show that the points (2,3,4), (-1,-2,1), (5,8,7) are collinear. [1]
- Q 10. Evaluate:  $\int_0^1 \frac{\sqrt{x}}{1+x^2} dx$ . [1]

### Section - B

- Q 11. Using properties of determinants, prove that  $|\begin{bmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{bmatrix}| = (ab+bc+ca)^3$ . [4]
- Q 12. Prove the following:  $\cot^{-1}(\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}) = x/2, x \in (0, \pi/4)$ . [4]
- Q 13. Differentiate  $\sin^{-1}(2x\sqrt{1-x^2})$  with respect to  $\cos^{-1}(\frac{1-x^2}{1+x^2})$ . [4]
- Q 14. Find the shortest distance between the lines, whose equations are  $(x-8)/3 = (y+9)/(-16) = (10-z)/(-7)$  and  $(x-5)/3 = (58-2y)/(-16) = (z-5)/(-5)$ . [4]
- Q 15. Find the value of a for which the function f defined as  $f(x) = \begin{cases} a \sin(\pi(x+1))/2, & x \leq 0 \\ \tan^{-1}(x - \sin x)/x^3, & x > 0 \end{cases}$  is continuous at  $x = 0$ . [4]
- Q 16. Use Rolle's theorem to find the condition for the polynomial equation  $f(x)=0$  to have a repeated real root. Hence or otherwise prove that  $1 + x/1! + x^2/2! + x^3/3! + \dots + x^n/n! = 0$ , can not have repeated root. [4]
- Q 17. Find the mean number of heads in three tosses of a fair coin. [4]
- Q 18. Evaluate  $\int_0^1 (3x^2 + 2x + 1) dx$  as the limit of the sum. [4]
- Q 19. Solve the differential equation:  $\cos^2 x \frac{dy}{dx} + y = \tan x$ . [4]
- Q 20. For what  $\lambda \in \mathbb{R}$  the system of equations [4]

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

$$x + \lambda y + 7 = 0$$

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

Is consistent? solve the equations for that value of  $\lambda$ .

**Q 21.** Evaluate the equation

$$\lim_{x \rightarrow 0} \left[ \frac{(\sqrt[3]{1+x^2}) - 1}{x^2} \right] . \quad [4]$$

**Q 22.** Find the domain and range of  $f(x) = \frac{x^2 - 3x + 2}{x^2 + x - 6}$ . [4]

**Q 23.** Evaluate:  $\int_0^{\pi/2} 2 \sin x \cos x \tan^{-1}(\sin x) dx$  [4]

**Q 24.** Let  $f(x) = 1 + x$ ,  $0 < x < 2$  [4]

$$3 - x, 2 < x < 3.$$

Determine  $f\{f(x)\}$  and hence find the points of discontinuity and non differentiability. Also, draw the graph of  $f\{f(x)\}$  at  $[0, 3]$ .

**Q 25.** Find the equation of the tangent line to the curve  $y = x^2 - 2x + 7$  is parallel to the line

$$2x - y + 9 = 0 . \quad [4]$$

### Section - C

**Q 26.** Solve the differential equation:  $(\tan^{-1}y - x)dy = (1 + y^2) dx$ . [5]

**Q 27.** Consider  $f : \mathbb{R} \rightarrow [-5, \infty)$  given by  $f(x) = 9x^2 + 6x - 5$ . Show that  $f$  is Invertible. [5]

Find the inverse of  $f$ .

**Q 28.** Use product  $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$  to solve the system of equations :

$$x - y + 2z = 1, 2y - 3z = 1 \text{ and } 3x - 2y + 4z = 2. \quad [5]$$

**Q 29.** Every gram of wheat provides 0.1 g of proteins and 0.25 g of carbohydrates. The corresponding values for rice are 0.05g and 0.5 g respectively. Wheat costs Rs. 4 per kg and rice Rs. 6 per kg. The minimum daily requirements of proteins and carbohydrates for an average child are 5 g and 200 g respectively. In what quantities should wheat and rice in the daily diet to provide minimum daily requirements of proteins and carbohydrates at minimum cost. Form a L.P.P. and solve it graphically. [5]

**Q 30.** A window has the shape of a rectangle surmounted by an equilateral triangle. If the perimeter of the window is 12 m, find the dimensions of the rectangle that will produce the largest area of the window. [5]