

VAISHALI EDUCATION POINT

(Quality Education Provider)

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SAMPLE PAPER – 2009

Class – XII

Subject – Mathematics

General Instructions:

- 1 All questions are compulsory
- 2 Q 1 – 10 carries 1 marks, Q 11 – 22 carries 4 marks Q-23to 29 carries 6 marks

1. The function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined as $f(x) = 10x+7$. find the function $g: \mathbb{R} \rightarrow \mathbb{R}$ such that $g \circ f = f \circ g = I_{\mathbb{R}}$
2. Prove that in a skew symmetric matrix all the entries of a diagonal are zero.
3. If $\tan^{-1}(x) = \sin^{-1}(1/2)$ find x
4. Given $A = \begin{pmatrix} 2 & -3 \\ -4 & 7 \end{pmatrix}$ verify $2A^{-1} = I - A$
5. Solve the differential equation $dy/dx = \sin(x+y)$
6. The total revenue received from the sale of x units of a product given by $R(x) = 3x^2+36x+5$ find the marginal revenue when $x = 5$
7. Evaluate $\int \operatorname{cosec} x \, dx$
8. If "a" is a unit vector $(x + a) \cdot (x - a) = 8$
9. Find the equation of a plane parallel to x axis and has intercepts 5 and 7 on y and z axis respectively.
10. If $P(A) = 3/8, P(B) = 1/2, P(A \cap B) = 1/4$ Find $P(B/A) = 0.5$ Find $P(A/B)$
11. Show that $f: \mathbb{R} \rightarrow A$ defined by $f(x) = x^2/x^2 + 1$ is a surjection. Find A .
12. Solve for x . $\tan^{-1}(x+1) + \tan^{-1}(x) + \tan^{-1}(x-1) = \tan^{-1}3$
13. If f is continuous at $x = \pi/2$ Find a and b

$$\begin{aligned} f(x) &= \frac{1 - \sin^3 x}{3\cos^2 x} \quad \text{if } x < \pi/2 \\ &= a \quad x = \pi/2 \\ &= \frac{b(1 - \sin x)}{(\pi - 2x)^2} \quad \text{if } x > \pi/2 \end{aligned}$$

14. Show that $\begin{vmatrix} a & a+b & a+2b \\ a+2b & x+3 & x+b \\ a+b & a+2b & a \end{vmatrix} = 9b^2(a+b)$
15. Differentiate $\tan^{-1} [\sqrt{1-\cos x}/1+\cos x]$ with respect to $\tan^{-1} x$
16. $\int \tan^{-1} \sqrt{x} dx$
17. Find the limit of sum using integration $\int_0^3 x^2 - 2x + 2 dx$
18. Evaluate using properties $\int_1^2 \log \{2+x/2-x\} dx$
19. The radius of the balloon is increasing at the rate of 10cm/sec. At what rate is the surface area of the balloon is increasing when its radius is 15cm
20. Find the area of the parallelogram whose diagonals are $d_1 = 3i+j-2k$ $d_2 = i-3j+4k$
21. Find the distance between the lines $r = i+2j-4k+\lambda(2i+3j+6k)$ and $r = 3i+3j-5k +\mu((2i+3j+6k)$
22. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of no of tails. Find mean and variance
23. Solve by matrix method

$$\begin{matrix} \underline{2} & + & \underline{3} & + & \underline{10} & = & 4, & \underline{4} & - & \underline{6} & + & \underline{5} & = & 1, & \underline{6} & + & \underline{9} & - & \underline{20} & = & 2 \\ x & y & z & & x & y & z & & x & y & z & & x & y & z & & x & y & z & & x & y & z \end{matrix}$$
24. A cylinder is such that the sum of its height and the circumference of its base is 10m. Find the greatest volume of the cylinder.
25. Find the area bounded by the curve $y = x^2 - 3x$ and the line $y = 2x$ (or)
26. The slope of a tangent to a curve at a point(x,y) on it is given by $(y/x) - \cot(y/x) \cos(y/x)$ ($x>0, y>0$) and curve passes through the point(1, $\pi/4$). Find the equation of the curve.
(or) Show that the differential equation $2ye^{x/y} dx + (y-2xe^{x/y})dy = 0$ is homogeneous and find its particular solution, given that when $x=0$, when $y = 1$
27. Find the equation of the plane passing through (1,2,-4) and parallel to the lines $r = i+2j-4k+\lambda(2i+3j+6k)$, $r = i-3j+5k+\mu(i+j-k)$ and also find the perpendicular distance of this plane from the origin, and find the direction cosines of its normal.
28. A dealer wishes to purchase a number of fans and sewing machines. He has only Rs 5760 to invest and has space for at the most 20 items. A fan costs him Rs 360 and sewing machine Rs 240. He expects to sell a fan at a profit of Rs 22 and a sewing machine for a profit of Rs 18. Assuming that he can sell all the items he buys, how should he invest his money to maximize his profit. Solve it graphically.
29. Suppose a girl throws a die. If she gets 5 or 6 she tosses the coin 3 times and notes the number of heads. If she gets 1,2,3 or 4 she tosses a coin once and notes whether a head or a tail is obtained if she obtained exactly one head what is the probability that she threw 1,2,3 or 4 with a die.

-Aim at the stars for even if you fall short you still land on the moon -