

- 1) The angle between the straight lines, whose direction cosines are given by the equations $2l + 2m - n = 0$ and $mn + nl + lm = 0$, is : (JEE M 2021)

- a) $\frac{\pi}{2}$ c) $\cos^{-1}\left(\frac{4}{9}\right)$
b) $\pi - \cos^{-1}\left(\frac{4}{9}\right)$ d) $\frac{\pi}{3}$

- 2) Let $A = \begin{bmatrix} [x] + 1 & [x] + 2 & [x] + 3 \\ [x] & [x] + 3 & [x] + 3 \\ [x] & [x] + 2 & [x] + 4 \end{bmatrix}$ where $[t]$ denotes the greatest integer less than or equal to t . If $\det(A) = 192$, then the set of values of x in the interval: (JEE M 2021)

- a) $[68, 69)$ c) $[65, 66)$
b) $[62, 63)$ d) $[60, 61)$

- 3) Let M and m respectively be the maximum and minimum values of the function $f(x) = \tan^{-1}(\sin x + \cos x)$ in $\left[0, \frac{\pi}{2}\right]$, then the value of $\tan(M - m)$ is equal to: (JEE M 2021)

- a) $2 + \sqrt{3}$ c) $3 + 2\sqrt{2}$
b) $2 - \sqrt{3}$ d) $3 - 2\sqrt{2}$

- 4) Each of the persons A and B independently tosses three fair coins. The probability that both of them get the same number of heads is: (JEE M 2021)

- a) $\frac{1}{8}$ b) $\frac{5}{8}$ c) $\frac{5}{16}$ d) 1

- 5) A differential equation representing the family of parabolas with axis parallel to y -axis and whose length of latus rectum is the distance of the point $(2, -3)$ from the line $3x + 4y = 5$, is given by: (JEE M 2021)

- a) $10 \frac{d^2y}{dx^2} = 11$ c) $10 \frac{d^2x}{dy^2} = 11$
b) $11 \frac{d^2x}{dy^2} = 10$ d) $11 \frac{d^2y}{dx^2} = 10$

- 6) If two tangents drawn from a point P to the parabola $y^2 = 16(x - 3)$ are at right angles, then the locus of point P is: (JEE M 2021)

a) $x + 3 = 0$

c) $x + 2 = 0$

b) $x + 1 = 0$

d) $x + 4 = 0$

- 7) The equation of the plane passing through the line of intersection of planes $\mathbf{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 1$ and $\mathbf{r} \cdot (2\hat{i} + 3\hat{j} - \hat{k}) + 4 = 0$ and parallel to the x-axis is:

a) $\mathbf{r} \cdot (\hat{j} - 3\hat{k}) + 6 = 0$

c) $\mathbf{r} \cdot (\hat{i} - 3\hat{k}) + 6 = 0$

b) $\mathbf{r} \cdot (\hat{i} + 3\hat{k}) + 6 = 0$

d) $\mathbf{r} \cdot (\hat{j} - 3\hat{k}) - 6 = 0$

- 8) If the solution curve of the differential equation $(2x - 10y^3)dy + ydx = 0$, passes through the points $(0, 1)$ and $(2, \beta)$, then β is a root of the equation:

(JEE M 2021)

a) $y^5 - 2y - 2 = 0$

c) $2y^5 - y^2 - 2 = 0$

b) $2y^5 - 2y - 1 = 0$

d) $y^5 - y^2 - 1 = 0$

- 9) Let $A(a, 0)$, $B(b, 2b + 1)$ and $C(0, b)$, $b \neq 0$, $\|b\| \neq 1$, be points such that the area of the triangle ABC is 1 sq. unit, then the sum of all possible values of a is: (JEE M 2021)

a) $\frac{-2b}{b+1}$

c) $\frac{2b^2}{b+1}$

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

d) $\frac{-2b^2}{b+1}$

- 10) Let $[\lambda]$ be the greatest integer less than or equal to λ . The set of all values of λ for which the system of linear equations $x + y + z = 4$, $3x + 2y + 5z = 3$, $9x + 4y + (28 + [\lambda])z = [\lambda]$ has a solution is:

(JEE M 2021)

a) \mathbb{R}

b) $(-\infty, -9) \cup (-9, \infty)$

c) $[-9, -8)$

d) $(-\infty, -9) \cup (-8, \infty)$

- 11) The set of all values of $k > -1$, for which the equation $(3x^2 + 4x + 3)^2 - (k + 1)(3x^2 + 4x + 3)(3x^2 + 4x + 2) + k(3x^2 + 4x + 2)^2 = 0$ has real roots, is: (JEE M 2021)

a) $(\frac{5}{2}, 1)$

c) $(-1, 1)$

b) $[2, 3)$

d) $(1, 3) - \{1\}$

- 12) A box open from top is made from a rectangular sheet of dimension $a \times b$ by cutting squares each of side x from each of the four corners and folding up the flaps. If the volume of the box is maximum, then x is equal to:

(JEE M 2021)

a) $\frac{a+b-\sqrt{a^2+b^2-ab}}{12}$

b) $\frac{a+b-\sqrt{a^2+b^2+ab}}{6}$

c) $\frac{a+b-\sqrt{a^2+b^2-ab}}{6}$

d) $\frac{a+b+\sqrt{a^2+b^2-ab}}{6}$

13) The Boolean expression $(p \wedge q) \implies ((r \wedge q) \wedge p)$ is equivalent to: (JEE M 2021)

a) $(p \wedge q) \implies (r \wedge q)$

c) $(p \wedge q) \implies (r \vee q)$

b) $(q \wedge r) \implies (p \wedge q)$

d) $(p \wedge r) \implies (p \wedge q)$

14) Let \mathbb{Z} be the set of all integers,

$$A = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : (x - 2)^2 + y^2 \leq 4\},$$

$$B = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : x^2 + y^2 \leq 4\},$$

$$C = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : (x - 2)^2 + (y - 2)^2 \leq 4\},$$

If the total number of relations from $A \cap B$ to $A \cap C$ is 2^p , then the value of p is:
(JEE M 2021)

a) 16

c) 49

b) 25

d) 9

15) The area of the region bounded by the parabola $(y - 2)^2 = (x - 1)$, the tangent to it at the point whose ordinate is 3 and the x-axis is: (JEE M 2021)

a) 9

b) 10

c) 4

d) 6