JEE Main 2024 Mathematics Question Paper Jan 31 Shift 1 (B.E./B.Tech)

JEE Main Mathematics Questions

Ques 1. In the expansion of $(1 + x)(1 - x^2)\ (1 + 3/x + 3/x^2 + 1/x^3)^5$ the sum of coefficients of x^3 and x^{-13} is

Ans. 118

Ques 2. If $f(x) = \begin{vmatrix} x^3 & 2x^2+1 & 1+3x \\ 3x^2+2 & 2x & x^3+6 \\ x^3-x & 4 & x^2-2 \end{vmatrix}$ **for all x** $\in$ **R, then 2f(0) + f'(0) is equal to**

Ans. 42

Ques 3. let 's' be the set of positive integral values of a for which $\frac{ax^2+2(a+1)x+9a+4}{x^2+8x+32} < 0, \forall x \in R.$ **Then, the number of elements in 's' is**

Ans. 0

Ques 4. If $f(x) = \frac{4x+3}{6x-4}, x \neq \frac{2}{3}$ **and** $(f \circ f)(x) = g(x)$**, where** $g: R - \left[\frac{2}{3} \rightarrow R \rightarrow \left\{\frac{2}{3}\right\}\right.$ **then** $(g \circ g \circ g)(4)$ **is equal to**

Ans. 4

Ques 5. If the system of linear equations x - 2y + z = -4; 2x + αy + 3z = 5 and 3x - y + βz = 3 has infinitely many solutions then 12α + 13β is equal to

Ans. 104.28

Ques 6. Sum of the series

$$\frac{1}{1-3\cdot1^2+1^4}+\frac{2}{1-3\cdot2^2+2^4}+\frac{3}{1-3\cdot3^2+3^4}+\cdots$$

upto 10 terms is____.

A. -55/109
B. 55/109
C. 45/109
D. - 45/109

Ans. A

Ques 7. If one of the diameters of the circle $x^2+y^2-10x+4y+13=0$ is a chord of another circle and whose center is the point of intersection of the lines 2x + 3y = 12 and 3x - 2y = 5 then the radius of the circle is

A. 6
B. 3√2
C. √20
D. 4

Ans. A

Ques 8. An urn contains 15 red, 10 white, 60 orange balls, 15 green balls. 2 balls are taken with replacement. Find the probability 1 ball is red and the other ball is white.

A. 2/27
B. 3/22
C. 1/33

D. 1/29

Ans. C

Ques 9. $\lim_{x\to 0} \frac{e^{|2\sin x|} - 2|\sin x| - 1}{x^2}$ **is**

A. Doesn't exist
B. 2
C. 1
D. -1

Ans. B

Ques 10. Let $\rightarrow a = 3\hat{i} + \hat{j} - 2\hat{k}$, $\rightarrow b = 4\hat{i} + \hat{j} + 7\hat{k}$ and $\rightarrow c = \hat{i} - 3\hat{j} + 4\hat{k}$ be 3 vectors. If a vector $\rightarrow p$ satisfies $\rightarrow p \times \rightarrow b = \rightarrow c \times \rightarrow b$ and $\rightarrow p \times \rightarrow a = 0$ then $\rightarrow p.(\hat{i} - \hat{j} - \hat{k})$ is equal to

A. 32
B. 23
C. 16
D. 61

Ans. A

Ques 11. The solution of differential equation $y\frac{dx}{dy} = x(\log_e x - \log_e y + 1)$ **x > 0, y > 0 and passing through (e, 1) is**

A. $|\log_e(y/x)| = y^2$
B. $2|\log_e(x/y)| = y$
C. $|\log_e(y/x)| = x$
D. $|\log_e(x/y)| = y$

Ans. D

Ques 12. A = {1, 2, 3, 4} , R = {(1, 2), (2, 3), (2, 4)} R $\subseteq$ S and S is an equivalence relation then the minimum number of elements to be added to R is n, then the value of n is?

Ans. 13