

JEE Main 2024 Mathematics Question Paper

Jan 30 Shift 1 (B.E./B.Tech)

JEE Main Mathematics Questions

Ques 1. If the length of the minor axis of an ellipse is equal to half of the distance between the foci, then the eccentricity of the ellipse is.

Ans. $2/\sqrt{5}$

Ques 2. Let (α, β, γ) be the foot of perpendicular from the point $(1, 2, 3)$ on the line $(x + 3)/5 = (y - 1)/2 = (z + 4)/3$ then $19(\alpha + \beta + \gamma)$

Ans. 101

Ques 3. If $z = x + iy$, $xy \neq 0$ satisfies the equation $z^2 + iz = 0$, then $|z^2|$; equal to

Ans. 1

Ques 4. Let $A(2, 3, 5)$ and $C(-3, 4, -2)$ be 'opposite vertices of a Parallelogram ABCD. If the diagonal $\vec{BD} = \hat{i} + 2\hat{j} + 3\hat{k}$ then the area of the Parallelogram is equal to.

Ans. $\sqrt{474}/2$

Ques 5. The value of $\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{n^5}{(n^2 + k^2)(n^2 + 3k^2)}$ is

- A. $[\pi/2\sqrt{3} - \pi/8]$
- B. $[\pi/2\sqrt{3} + \pi/8]$
- C. $[\pi/2 - \pi/\sqrt{3}]$

D. $[\pi/\sqrt{3} - \pi/4]$

Ans. A

Ques 6. If the foot is perpendicular from (1, 2, 3) to the line $(x+1)/2 = (y-2)/5 = (z-1)/1$ is (a, β , γ), then find $a + \beta + \gamma$.

- A. 6
- B. 5.8
- C. 4.8
- D. 5

Ans. B

Ques 7. In an arithmetic progression if sum of 20 terms is 790 and sum of 10 terms is 145, then $S_{15} - S_5$ is (when S_n denotes sum of n terms)

- A. 400
- B. 395
- C. 285
- D. 405

Ans. B

Ques 8. The value of maximum area possible of a ΔABC such that $A(0, 0)$, $B(x, y)$ and $C(-x, y)$ such that $y = -2x^2 + 54x$ is: (in sq. unit)

- A. 5800
- B. 5832
- C. 5942
- D. 6008

Ans. B

Ques 9. The range of r for which circles $(x + 1)^2 + (y + 2)^2 = r^2$ and $x^2 + y^2 - 4x - 4y + 4 = 0$ coincide at two distinct points.

- A. $3 < r < 7$
- B. $5 < r < 9$
- C. $1/2 < r < 4$
- D. $0 < r < 3$

Ans. A

Ques 10. An ellipse whose length of minor axis is equal to half of length between foci, then eccentricity is

- A. $7/2$
- B. $\sqrt{17}$
- C. $2/\sqrt{5}$
- D. $3/\sqrt{7}$

Ans. C

Ques 11. The domain of $y = \cos^{-1} \left| \frac{2 - |x|}{4} \right| \log(3 - x)^{-1}$ is $[\alpha, \beta] - \{y\}$ then the value of $\alpha + \beta - y = ?$

- A. 9
- B. 12
- C. 11
- D. 10

Ans. C

Ques 12. If $y = f(x)$ is solution of differential equation

$(x^2 - 1) dy = ((x^3 + 1) + \sqrt{1 - x^2}) dx$ and $y(0) = 2$ then find $y(1/2)$

- A. $13/7 - \pi/2 + \ln(5)$
- B. $15/7 + \pi/3 + \ln(2)$
- C. $17/8 + \pi/6 - \ln(2)$
- D. $18/7 - \pi/6 + \ln(3)$

Ans. C

Ques 13. Given $x^2 - 70x + \lambda = 0$ with positive integral roots α and β where one of the root is less than 10, and $\lambda/2$ & $\lambda/3$ are not

$$\frac{\sqrt{\alpha-1} + \sqrt{\beta-1}}{|\alpha-\beta|}$$

integers, then find value of

- A. $\frac{1}{6}$
- B. $\frac{1}{12}$
- C. $\frac{1}{12}$
- D. $\frac{1}{70}$

Ans. A

Ques 14. A line passes through $(9,0)$, making angle 30° with positive direction of Xaxis. It is rotated by angle of 15° with respect to $(9,0)$. Then, the equation of new line is

- A. $y = (2 + \sqrt{3})(x - 9)$
- B. $y = (2 - \sqrt{3})(x - 9)$
- C. $y = 2(x - 9)$
- D. $y = -(x - 9)$

Ans. B

Ques 15. If $|\vec{a}| = 1, |\vec{b}| = 4, \vec{a} \cdot \vec{b} = 2(\vec{a} \cdot \vec{b}) - 3|\vec{b}|$
Then the angle between $\vec{b}$ and $\vec{c}$ is

- A. $\theta = \cos^{-1}(-(\sqrt{3})/2)$
- B. $\theta = \cos^{-1}((\sqrt{3})/2)$
- C. $\theta = \cos^{-1}(1/2)$
- D. $\theta = \cos^{-1}(-1/2)$

Ans. A

Ques 16. Given set $S = \{0, 1, 2, 3, \dots, 10\}$. If a random ordered pair (x, y) of elements of S is chosen, then find probability that $|x - y| > 5$

- A. $30/121$
- B. $31/121$
- C. $62/121$
- D. $64/121$

Ans. A

Ques 17. Number of integral terms in the binomial expansion of $(7^{1/2} + 11^{1/6})^{824}$ is_____.

Ans. 138

Ques 18. $\int_0^9 \left[\sqrt{\frac{10x}{x+1}} \right] dx$ is equal to (where $[]$ represents greatest integer function)

Ans. 155

Ques 19. In a class there are 40 students. 16 passed in Chemistry, 20 passed in Physics, 25 passed in Math. 15 students passed in both Math and Physics. 15 students passed in both Math and Chemistry and 10 students passed in both Physics and Chemistry. Find the maximum number of students that passed in all the subjects.

Ans. 19

Ques 20. For the following data table

x_i	f_i
0 – 4	2
4 – 8	4
8 – 12	7
12 – 16	8
16 – 20	6

Find the value of $20M$ (where M is median of the data)

Ans. 245