JEE MAINS 6 Sept 2020 Shift-1

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1) The region represented by $\{z = x + \iota y \in C : z - \mathrm{Re}(z) \le 1\}$ is also given by the inequality : $\{z = x + \iota y \in C : z - \mathrm{Re}(z) \le 1\}$

a) $y^2 \le 2\left(x + \frac{1}{2}\right)$ b) $y^2 \le x + \frac{1}{2}$ c) $y^2 \le 2(x + 1)$ d) $y^2 \le x + 1$

2) The negation of the Boolean expression $p \vee (\sim p \wedge q)$ is equivalent to :

a) $\sim p \vee \sim q$ b) $\sim p \vee q$ c) $\sim p \wedge \sim q$ d) $p \wedge \sim q$

3) The general solution of the differential equation $\sqrt{1 + x^2 + y^2 + x^2y^2} + xy\left(\frac{dy}{dx}\right) = 0$ (where C is a constant of integration)

a) $\sqrt{1 + y^2} + \sqrt{1 + x^2} = \frac{1}{2}\log_e\left(\frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1}\right) + c$

b) $\sqrt{1 + y^2} - \sqrt{1 + x^2} = \frac{1}{2}\log_e\left(\frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1}\right) + c$

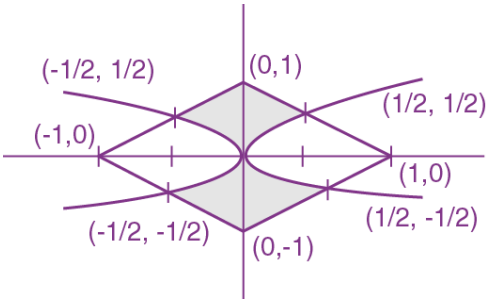
c) $\sqrt{1 + y^2} + \sqrt{1 + x^2} = \frac{1}{2}\log_e\left(\frac{\sqrt{1+x^2}+1}{\sqrt{1+x^2}-1}\right) + c$

d) $\sqrt{1 + y^2} - \sqrt{1 + x^2} = \frac{1}{2}\log_e\left(\frac{\sqrt{1+x^2}+1}{\sqrt{1+x^2}-1}\right) + c$

4) Let L_1 be a tangent to the parabola $y^2 = 4(x + 1)$and L_2 be a tangent to the parabola $y^2 = 8(x + 2)$ such that L_1 and L_2 intersect at right angles. Then L_1 and L_2 meet on the straight line:

a) $x + 2y = 0$ b) $x + 2 = 0$ c) $2x + 1 = 0$ d) $x + 3 = 0$

5) The area (in sq. units) of the region A $= \left\{(x, y) : |x| + |y| \le 1, 2y^2 \ge |x|\right\}$



a) $\frac{1}{6}$ b) $\frac{5}{6}$ c) $\frac{1}{3}$ d) $\frac{7}{6}$

6) The shortest distance between the lines $\frac{x-1}{0} = \frac{y+1}{-1} = \frac{z}{1}$ and $x+y+z+1=0, 2x-y+z+3=0$ is :

a) 1 b) $\frac{1}{\sqrt{2}}$ c) $\frac{1}{\sqrt{3}}$ d) $\frac{1}{2}$

7) Let a, b, c, d and p be any non zero distinct real numbers such that $\left(a^2+b^2+c^2\right)p^2 - 2(ab+bc+cd)p + \left(b^2+c^2+d^2\right) = 0$. Then:

a) a, c, p are in G.P.
b) a, b, c, d are in G.P.
c) a, b, c, d are in A.P.
d) a, c, p are in A.P.

8) Two families with three members each and one family with four members are to be seated in a row. In how many ways can they be seated so that the same family members are not separated?

a) $(2!)(3!)(4!)$ b) $(3!)^3(4!)$ c) $(3!)(4!)^3$ d) $(3!)^2(4!)$

9) The values of λ and μ for which the system of linear equations
$x+y+z=2$
$x+2y+3z=5$
$x+3y+\lambda z=\mu$
has infinitely many solutions are, respectively:

a) 6 and 8 b) 5 and 8 c) 5 and 7 d) 4 and 9

10) Let m and M be respectively the minimum and maximum values of

$$\begin{vmatrix} \cos^2 x & 1+\sin^2 x & \sin 2x \\ 1+\cos^2 x & \sin^2 x & \sin 2x \\ \cos^2 x & \sin^2 x & 1+\sin 2x \end{vmatrix}$$

Then the ordered pair (m, M) is equal to:

a) $(-3,-1)$ b) $(-4,-1)$ c) $(1,3)$ d) $(-3,3)$

11) A ray of light coming from the point $\begin{pmatrix} 2 \\ 2\sqrt{3} \end{pmatrix}$ is incident at an angle 30° on the line $x=1$ at the point **A**. The ray gets reflected on the line $x=1$ and meets x-axis at the point **B**. Then, the line AB passes through the point:

a) $\begin{pmatrix} 4 \\ -\sqrt{3} \end{pmatrix}$ b) $\begin{pmatrix} 3 \\ -\frac{1}{\sqrt{3}} \end{pmatrix}$ c) $\begin{pmatrix} 3 \\ -\sqrt{3} \end{pmatrix}$ d) $\begin{pmatrix} 4 \\ -\frac{\sqrt{3}}{2} \end{pmatrix}$

12) Out of 11 consecutive natural numbers if three numbers are selected at random (without repetition), then the probability that they are in A.P. with positive common difference, is:

a) $\frac{10}{99}$ b) $\frac{5}{33}$ c) $\frac{15}{101}$ d) $\frac{5}{101}$

13) If $f(x+y) = f(x)f(y)$ and $\sum_{x=1}^{\infty} f(x) = 2$,
$x, y \in$N, where N is the set of all natural number, then the value of $\frac{f(4)}{f(2)}$ is:

a) $\frac{2}{3}$ b) $\frac{1}{9}$ c) $\frac{1}{3}$ d) $\frac{4}{9}$

14) If $\{p\}$ denotes the fractional part of the number p, then $\left\{\frac{3^{200}}{8}\right\}$ is equal to:

a) $\frac{5}{8}$ b) $\frac{1}{8}$ c) $\frac{7}{8}$ d) $\frac{3}{8}$

15) Which of the following points lies on the locus of the foot of perpendicular drawn upon any tangent to the ellipse $\left(\frac{x^2}{4}\right) + \left(\frac{y^2}{2}\right) = 1$ from any of its foci ?

a) $\begin{pmatrix} -1 \\ -\sqrt{3} \end{pmatrix}$ b) $\begin{pmatrix} -2 \\ -\sqrt{3} \end{pmatrix}$ c) $\begin{pmatrix} -1 \\ -\sqrt{2} \end{pmatrix}$ d) $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$