jee-main-maths-24-02-2021-shift-1

EE24BTECH11030 - J.KEDARANANDA

1) The locus of the mid-point of the line segment joining the focus of the parabola $y^2 = 4ax$ to a moving point of the parabola, is another parabola whose directrix is:

a) x = a b) x = 0 c) x = -a/2 d) x = a/2

2) A scientific committee is to formed from 6 Indians and 8 foreigners, which includes at least 2 Indians and double the number of foreigners as Indians. Then the number of ways, the committee can be formed is:

a) 560 b) 1050 c) 1625 d) 575

3) The equation of the plane passing through the point (1,2,-3) and perpendicular to the planes $3x + y - 2z = 5$ and $2x - 5y - z = 7$, is:

a) $3x - 10y - 2z + 11 = 0$
b) $6x - 5y - 2z - 2 = 0$
c) $11x + y + 17z + 38 = 0$
d) $6x - 5y + 2z + 10 = 0$

4) A man is walking on a straight line. The arithmetic mean of the reciprocals of the intercepts of this line on the coordinate axes is 1/4. Three stones A, B and C are placed at the points (1,1),(2,2), and (4,4) respectively. Then which of these stones is/are on the path of the man?

a) B only b) A only c) the three d) C only

5) The statement among the following that is a tautology is:

a) $A \wedge (A \vee B)$
b) $B \rightarrow [A \wedge (A \rightarrow B)]$
c) $A \vee (A \wedge B)$
d) $[A \wedge (A \rightarrow B) \rightarrow B]$

6) Let f : R $\rightarrow$ R be defined as f(x) = $2x - 1$ and g : R-{1} $\rightarrow$ R be defined as g(x) = $\frac{(x-\frac{1}{2})}{(x-1)}$.
Then the composition function f(g(x)) is:

a) Both one-one and onto
b) onto but not one-one
c) Neither one-one nor onto
d) one-one but not onto

7) If f : R → R is a function defined by f(x) = [x - 1] $\cos\left(\frac{2x-1}{2}\right)\pi$, where [.] denotes the greatest integer function, then f is:

a) discontinuous only at x = 1
b) discontinuous at all integral values of x except at x = 1
c) continuous only at x = 1
d) continuous for every real x

8) The function f(x) = $\frac{(4x^3-3x^2)}{6} - 2\sin x + (2x-1)\cos x$

a) increases in $[\frac{1}{2}, \infty)$
b) decreases $(-\infty, \frac{1}{2}]$
c) increases in $(-\infty, \frac{1}{2}]$
d) decreases $[\frac{1}{2}, \infty)$

9) The distance of the point (1,1,9) from the point of intersection of the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ and the plane $x + y + z = 17$ is:

a) increases in $\sqrt{38}$
b) decreases $19\sqrt{2}$
c) increases in $2\sqrt{19}$
d) decreases 38

10) $\lim_{x\to 0} \frac{\int_0^{x^2} \sin(\sqrt{t})\,dt}{x^3}$ is equal to:

a) $\frac{2}{3}$ b) 0 c) $\frac{1}{15}$ d) $\frac{3}{2}$

11) Two vertical poles are 150 m apart and the height of one is three times that of the other. If from the middle point of the line joining their feet, an observer finds the angles of elevation of their tops to be complementary, then the height of the shorter pole (in meters) is:

a) 25 b) $20\sqrt{3}$ c) 30 d) $25\sqrt{3}$

12) If the tangent to the curve $y = x^3$ at the point $\mathbf{P}\left(t, t^3\right)$ meets the curve again at **Q**, then the ordinate of the point which divides PQ internally in the ratio 1:2 is:

a) $-2t^3$ b) $-t^3$ c) 0 d) $2t^3$

13) The area (in sq.units) of the part of the circle $x^2 + y^2 = 36$, which is outside the parabola $y^2 = 9x$, is:

a) $24\pi + 3\sqrt{3}$ b) $12\pi + 3\sqrt{3}$ c) $12\pi - 3\sqrt{3}$ d) $24\pi - 3\sqrt{3}$

14) If $\int \frac{\cos x - \sin x}{\sqrt{8 - \sin 2x}}\, dx = a\frac{\sin^{-1}(\sin x + \cos x)}{b} + c$, where c is a constant of integration, then the ordered pair (a, b) is equal to:

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

15) The population P = P(t) at time 't' of a certain species follows the differential equation $\frac{dP}{dt} = 0.5P - 450$. If P(0) = 850, then the time at which population becomes zero is:

a) $\frac{1}{2}\ln 18$ b) $2\ln 18$ c) $\ln 9$ d) $\ln 18$