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AI24BTECH11011 - Himani Gourishetty

1) For which of the following ordered pairs (μ, δ), the system of linear equations

$$\begin{aligned} x + 2y + 3z &= 1 \\ 3x + 4y + 5y &= \mu \\ 4x + 4y + 4z &= \delta \end{aligned}$$

is inconsistent?
   a) $(4, 6)$
   b) $(3, 4)$
   c) $(1, 0)$
   d) $(4, 3)$
2) Let $y = (x)$ be a solution of the differential equation,
$\sqrt{1 - x^2}\frac{dy}{dx} + \sqrt{1 - y^2} = 0, |x| < 1$
. If $y\left(\frac{1}{2}\right) = \sqrt{\frac{3}{2}}$, then $y\left(\frac{-1}{\sqrt{2}}\right)$ is equal to
   a) $\frac{-1}{\sqrt{2}}$
   b) $\frac{-\sqrt{3}}{2}$
   c) $\frac{1}{\sqrt{2}}$
   d) $\frac{\sqrt{3}}{2}$
3) If a, b and c are the greatest values of ${}^{19}C_p, {}^{20}C_q, {}^{21}C_r$, respectively, then:
   a) $\left(\frac{a}{11}\right) = \left(\frac{b}{22}\right) = \left(\frac{c}{42}\right)$
   b) $\left(\frac{a}{10}\right) = \left(\frac{b}{11}\right) = \left(\frac{c}{42}\right)$
   c) $\left(\frac{a}{11}\right) = \left(\frac{b}{22}\right) = \left(\frac{c}{21}\right)$
   d) $\left(\frac{a}{10}\right) = \left(\frac{b}{11}\right) = \left(\frac{c}{21}\right)$
4) Which of the following is a tautology?
   a) $((P \wedge (P \rightarrow Q)) \rightarrow Q)$
   b) $P \wedge (P \vee Q)$
   c) $Q \rightarrow (P \wedge (P \rightarrow Q))$
   d) $P \vee (P \wedge Q)$
5) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be such that for all $x \in \mathbb{R}, \left(2^{1+X} + 2^{1-x}\right), f(x)$ and $(3^x + 3^{-x})$ are in A.P. Then the minimum value of $f(x)$ is
   a) 0
   b) 4
   c) 3
   d) 2
6) The locus of a point which divides the line segment joining the point $(0, -1)$ and a point on the parabola, $x^2 = 4y$, internally in the ratio $1 : 2$, is:
   a) $9x^2 - 12y = 8$
   b) $4x^2 - 3y = 2$
   c) $x^2 - 3y = 2$

d) $9x^2 - 3y = 2$

7) For $a > 0$, let the curves $C_1 : y^2 = ax$ and $C_2 : x^2 = ay$ intersect at origin **O** and a point **P**. Let the line $x = b\,(0 < b < a)$ intersect the chord OP and the x-axis at points **Q** and **R**, respectively. If the line $x = b$ bisects the area bounded by the curves, C_1 and C_2 , and the area of $\Delta OQR = \frac{1}{2}$,then 'a' satisfies the equation
 a) $x^6 - 12x^3 + 4 = 0$
 b) $x^6 - 12x^3 - 4 = 0$
 c) $x^6 + 6x^3 - 4 = 0$
 d) $x^6 - 6x^3 + 4 = 0$

8) The inverse function of $f(x) = \frac{8^{2x}-8^{-2x}}{8^{2x}+8^{-2x}}, x \in (-1, 1)$, is
 a) $\frac{1}{4}(\log_8 e)\log_e\left(\frac{1-x}{1+x}\right)$
 b) $\frac{1}{4}(\log_8 e)\log_e\left(\frac{1+x}{1-x}\right)$
 c) $\frac{1}{4}\log_e\left(\frac{1+x}{1-x}\right)$
 d) $\frac{1}{4}\log_e\left(\frac{1-x}{1+x}\right)$

9) $\lim_{x\to 0}\left(\frac{3x^2+2}{7x^2+2}\right)^{\frac{1}{x^2}}$ is equal to
 a) e
 b) $\frac{1}{e^2}$
 c) $\frac{1}{e}$
 d) e^2

10) $f(x) = \left(\sin\left(\tan^{-1} x\right) + \sin\left(\cot^{-1} x\right)\right)^2 - 1$, where $|x| > 1$. If $\frac{dy}{dx} = \frac{1}{2}\frac{d}{dx}\left(\sin^{-1} f(x)\right)$ and $y\left(\sqrt{3}\right) = \frac{\pi}{6}$, then $y\left(-\left(\sqrt{3}\right)\right)$ is equal to:
 a) $\frac{\pi}{3}$
 b) $\frac{2\pi}{3}$
 c) $\frac{-\pi}{6}$
 d) $\frac{5\pi}{6}$

11) If the equation, $x^2 + bx + 45 = 0\,(b \in \mathbb{R})$ has conjugate complex roots and they satisfy $|z + 1| = 2\sqrt{10}$, then:
 a) $b^2 + b = 12$
 b) $b^2 - b = 42$
 c) $b^2 - b = 30$
 d) $b^2 + b = 72$

12) The mean and standard deviation ($s.d$) of 10 observations are 20 and 2 respectively. Each of these 10 observations is multiplied by p and then reduced by q, where $p \neq 0$ and $q \neq 0$. If the new mean and standard deviation become half of their original values, then q is equal to:
 a) -20
 b) -5
 c) 10
 d) -10

13) If $\int \frac{\cos x}{\sin^3 x\left(1+\sin^6 x\right)^{\frac{2}{3}}}dx = f(x)\left(1 + \sin^6 x\right)^{\frac{1}{\lambda}} + c$, where c is a constant of integration, then $\lambda f\left(\frac{\pi}{3}\right)$ is equal to:
 a) $-\frac{9}{8}$
 b) $\frac{9}{8}$
 c) 2
 d) -2

14) Let A and B be two independent events such that $P(A)\,\frac{1}{3}$ and $P(B) = \frac{1}{6}$. Then, which of the following

is TRUE ?

a) $P\left(\frac{A}{A\cup B}\right) = \frac{1}{4}$

b) $P\left(\frac{A}{B'}\right) = \frac{1}{3}$

c) $P\left(\frac{A}{B}\right) = \frac{2}{3}$

d) $P\left(\frac{A'}{B'}\right) = \frac{1}{3}$

15) If volume of parallelepiped whose coterminous edges are given by
$\mathbf{u} = \hat{i} + \hat{j} + \lambda\hat{k}$,
$\mathbf{v} = \hat{i} + \hat{j} + 3\hat{k}$
and
$\mathbf{w} = 2\hat{i} + \hat{j} + \hat{k}$
be 1 cu.unit. if θ be the angle between the edges $\mathbf{u}$ and $\mathbf{w}$ then, $\cos\theta$ can be:

a) $\frac{7}{6\sqrt{6}}$

b) $\frac{5}{7}$

c) $\frac{7}{6\sqrt{3}}$

d) $\frac{5}{3\sqrt{3}}$