2021-February
Session-02-26-2021-shift-1-16-30

AI24BTECH11031 - Shivram S

1) The value of $\lim_{h\to 0} 2\left\{\frac{\sqrt{3}\sin\left(\frac{\pi}{6}-h\right)-\cos\left(\frac{\pi}{6}+h\right)}{\sqrt{3}h\left(\sqrt{3}\cos h-\sin h\right)}\right\}$ is

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

2) A fair coin is tossed a fixed number of times. If the probability of getting 7 heads is equal to the probability of getting 9 heads, then the probability of getting 2 heads is:

a) $\frac{15}{2^{12}}$ b) $\frac{15}{2^{13}}$ c) $\frac{15}{2^{14}}$ d) $\frac{15}{2^{8}}$

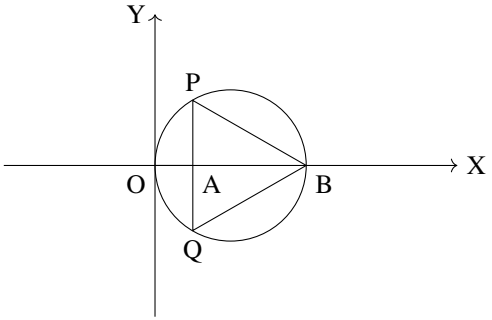
3) If $(1,5,35)$, $(7,5,5)$, $(1,\lambda,7)$ and $(2\lambda,1,2)$ are coplanar, then the sum of all possible values of λ is:

a) $-\frac{44}{5}$ b) $\frac{39}{5}$ c) $-\frac{39}{5}$ d) $\frac{44}{5}$

4) Let $R = \{(P,Q) \mid \text{P and Q are at the same distance from the origin}\}$ be a relation, then the equivalence class of $(1,-1)$ is the set:

a) $S = \left\{(x,y) \mid x^2+y^2 = 1\right\}$
b) $S = \left\{(x,y) \mid x^2+y^2 = 4\right\}$
c) $S = \left\{(x,y) \mid x^2+y^2 = \sqrt{2}\right\}$
d) $S = \left\{(x,y) \mid x^2+y^2 = 2\right\}$

5) In the circle given below, let $OA = 1$ unit, $OB = 13$ unit and PQ perpendicular to OB. Then, the area of the triangle PQB (in square units) is:



a) $26\sqrt{3}$ b) $24\sqrt{2}$ c) $24\sqrt{3}$ d) $26\sqrt{2}$

6) The area bounded by the lines $y = |x-1| - 2$ is _____.
7) The number of integral values of k for which the equation $3\sin x + 4\cos x = k + 1$ has a solution, $k \in \mathbb{R}$ is _____.
8) Let $m, n \in \mathbb{N}$ and $\gcd(2, n) = 1$. If $30\binom{30}{0} + 29\binom{30}{1} + \cdots + 2\binom{30}{28} + 1\binom{30}{29} = n \cdot 2^m$, then $n + m =$ _____.
9) If $y = y(x)$ is the solution of the equation $e^{\sin y}\cos y\frac{dy}{dx} + e^{\sin y}\cos x = \cos x$, $y(0) = 0$; then $1 + y\left(\frac{\pi}{6}\right) + \frac{\sqrt{3}}{2}y\left(\frac{\pi}{3}\right) + \frac{1}{\sqrt{2}}y\left(\frac{\pi}{4}\right)$ is equal to _____.
10) The number of solutions of the equation $\log_4(x-1) = \log_2(x-3)$ is _____.
11) If $\sqrt{3}(\cos^2 x) = (\sqrt{3} - 1)\cos x + 1$, the number of solutions of the given equation when $x \in \left[0, \frac{\pi}{2}\right]$ is _____.
12) Let $(\lambda, 2, 1)$ be a point on the plane which passes through the point $(4, -2, 2)$. If the plane is perpendicular to the line joining the points $(-2, -21, 29)$ and $(-1, -16, 23)$, then $\left(\frac{\lambda}{11}\right)^2 - \frac{4\lambda}{11} - 4$ is equal to _____.
13) The difference between degree and order of a differential equation that represents the family of curves given by $y^2 = a\left(x + \frac{\sqrt{a}}{2}\right)$, $a > 0$ is _____.
14) The sum of 162^{th} power of the roots of the equation $x^3 - 2x^2 + 2x - 1 = 0$ is _____.
15) The value of the integral $\int_0^{\pi} |\sin 2x|\, dx$ is _____.