

MHT CET 2024 Mathematics Answer Key PDF

Answer Key

Question 1 Correct Answer – (A) $-2\hat{i} + 7\hat{j} + 13\hat{k}$

Explanation: A vector parallel to the line of intersection of the planes is given by the cross product of their normal vectors $\vec{n}_1 \times \vec{n}_2 = (3\hat{i} - \hat{j} + \hat{k}) \times (\hat{i} + 4\hat{j} - 2\hat{k}) = -2\hat{i} + 7\hat{j} + 13\hat{k}$.

Question 2 Correct Answer – (A) 60°

Explanation: Substituting $n = -(l + m)$ into the standard intended relation $l^2 + m^2 - n^2 = 0$ yields $-2lm = 0 \implies l = 0$ or $m = 0$. This gives direction ratios $(0, 1, -1)$ and $(1, 0, -1)$, which intersect at 60° .

Question 3 Correct Answer – (B) 1.3125

Explanation: Summing the probabilities to 1 yields $\frac{5}{16} + \frac{5}{16} + \frac{2k}{48} + \frac{4}{16} = 1 \implies k = 3$. Calculating the expected value gives $E(X) = 0(\frac{5}{16}) + 1(\frac{5}{16}) + 2(\frac{6}{48}) + 3(\frac{1}{4}) = \frac{21}{16} = 1.3125$.

Question 4 Correct Answer – (D) $6 \text{ cm}^3/\text{sec}$

Explanation: From $A = 4\pi r^2$, we have $\frac{dA}{dt} = 8\pi r \frac{dr}{dt} \implies \frac{dr}{dt} = \frac{1}{24\pi}$. Substituting this into the volume derivative $\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$ at $r = 6$ yields $6 \text{ cm}^3/\text{sec}$.

Question 5 Correct Answer – (B) $(-3, 8)$

Explanation: The function is strictly decreasing where $f'(x) < 0$. Differentiating gives $6x^2 - 30x - 144 < 0 \implies (x - 8)(x + 3) < 0$, which yields the interval $(-3, 8)$.

Question 6 Correct Answer – (A) $(y^2 \cot x)/(1 - y \log(\sin x))$

Explanation: Taking the natural logarithm of both sides gives $\log y = y \log(\sin x)$. Differentiating implicitly with respect to x and solving for $\frac{dy}{dx}$ yields the required expression.

Question 7 Correct Answer – (B) $7\pi/10$

Explanation: Using the identity $\sin^{-1}\theta + \cos^{-1}\theta = \pi/2$, we can rewrite the expression as $(\pi/2 - \sin^{-1}x) + (\pi/2 - \cos^{-1}y) = \pi - (\sin^{-1}x + \cos^{-1}y) = \pi - 3\pi/10 = 7\pi/10$.

Question 8 Correct Answer – (D) $7\pi/6$

Explanation: Since $\sin(-600^\circ) = \sin 60^\circ = \sqrt{3}/2$, we get $\sin^{-1}(\sqrt{3}/2) = \pi/3$. Combining this with $\cot^{-1}(-\sqrt{3}) = 5\pi/6$ yields $\pi/3 + 5\pi/6 = 7\pi/6$.

Question 9 Correct Answer – (D) $1, -1$

Explanation: Using $AA^{-1} = I$, the product of the first row of A and the third column of $2A^{-1}$ gives $2c + 2 = 0 \implies c = -1$. Similarly, the third row of A and the first column of $2A^{-1}$ gives $8 - 8a = 0 \implies a = 1$.

Question 10 Correct Answer – (B) $(2n + 1)/3$

Explanation: The expectation is $E(X) = \sum xP(X) = \frac{2}{n(n+1)} \sum_{x=1}^n x^2$. Substituting the sum of squares formula $\frac{n(n+1)(2n+1)}{6}$ simplifies directly to $\frac{2n+1}{3}$.