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MHT CET 2025 Mathematics Answer Key PDF

Mathematics

1. **Option (2)** $4/\pi$ m/min
Explanation: Volume of a cylinder is $V = \pi r^2 h$. Given $r = 3$ m and $\frac{dV}{dt} = 36$ m^3/min. Differentiating with respect to t: $\frac{dV}{dt} = \pi r^2 \frac{dh}{dt}$. Substituting the values: $36 = \pi(3)^2 \frac{dh}{dt} \Rightarrow 36 = 9\pi \frac{dh}{dt} \Rightarrow \frac{dh}{dt} = \frac{4}{\pi}$ m/min.

2. **Option (3)** 8
Explanation: Let $\vec{u} = \vec{a} + \lambda\vec{b} = (2-\lambda)\hat{i} + (2+2\lambda)\hat{j} + (3+\lambda)\hat{k}$. Since $\vec{u}$ is perpendicular to $\vec{c} = 3\hat{i} + \hat{j}$, their dot product is zero: $3(2-\lambda) + 1(2+2\lambda) + 0(3+\lambda) = 0 \Rightarrow 6 - 3\lambda + 2 + 2\lambda = 0 \Rightarrow 8 - \lambda = 0 \Rightarrow \lambda = 8$.

3. **Option (2)** 56/65
Explanation: Let $\cos^{-1}(12/13) = \alpha \Rightarrow \sin\alpha = 5/13$. Let $\sin^{-1}(3/5) = \beta \Rightarrow \cos\beta = 4/5$. The equation is $\sin^{-1}(\sin(\alpha+\beta)) = \sin^{-1} P$. Using the addition formula: $P = \sin\alpha\cos\beta + \cos\alpha\sin\beta = (\frac{5}{13})(\frac{4}{5}) + (\frac{12}{13})(\frac{3}{5}) = \frac{20+36}{65} = \frac{56}{65}$.

4. **Option (4)** 9 sq. units
Explanation: Points of intersection: $(2x-4)^2 = 4x \Rightarrow 4x^2 - 16x + 16 = 4x \Rightarrow x^2 - 5x + 4 = 0 \Rightarrow x = 1, 4$. Corresponding $y = -2, 4$. Integrating with respect to y: Area $= \int_{-2}^{4} \left[\frac{y+4}{2} - \frac{y^2}{4}\right] dy = \left[\frac{y^2}{4} + 2y - \frac{y^3}{12}\right]_{-2}^{4}$. Evaluating gives $(4 + 8 - \frac{16}{3}) - (1 - 4 + \frac{2}{3}) = \frac{20}{3} + \frac{7}{3} = \frac{27}{3} = 9$.

5. **Option (2)** $\frac{5}{1+25x^2}$
Explanation: Using $\tan^{-1} A + \tan^{-1} B = \tan^{-1}\frac{A+B}{1-AB}$, the first term is $\tan^{-1}(2/3) + \tan^{-1} x$. The second term simplifies as $\tan^{-1}\frac{5x-x}{1+(5x)(x)} = \tan^{-1}(5x) - \tan^{-1} x$. Adding them gives $y = \tan^{-1}(2/3) + \tan^{-1}(5x)$. Thus, $\frac{dy}{dx} = 0 + \frac{1}{1+(5x)^2} \cdot 5 = \frac{5}{1+25x^2}$.

6. **Option (3)** $x^2 + y^2 = x^4$
Explanation: This is a homogeneous equation. Putting $y = vx$, we get $v + x\frac{dv}{dx} = \frac{1+2v^2}{v} = \frac{1}{v} + 2v \Rightarrow x\frac{dv}{dx} = \frac{1+v^2}{v}$. Integrating: $\frac{1}{2}\ln(1+v^2) = \ln x + \ln C \Rightarrow 1 + \frac{y^2}{x^2} = C^2x^2 \Rightarrow x^2 + y^2 = C^2x^4$. At $y(1) = 0$, $1 = C^2$, so $x^2 + y^2 = x^4$.

7. **Option (3)** 45/7
Explanation: For a line with direction $\vec{b} = (1, 2, 2)$ and a plane with normal $\vec{n} = (2, -1, \lambda)$, the angle θ satisfies $\sin\theta = \frac{|\vec{b}\cdot\vec{n}|}{|\vec{b}||\vec{n}|}$. Setting $\theta = \pi/6$ ($\sin\theta = 1/2$) and solving for the variable missing in the transcription leads to the value 45/7 which represents λ^2 in the system.

8. **Option (3)** 4
Explanation: Volume $V = \frac{1}{6}|[\vec{AB}, \vec{AC}, \vec{AD}]|$. Vectors are $\vec{AB} = (-4, -3, -2)$, $\vec{AC} = (1, -1, 0)$, $\vec{AD} = (-2, 0, x-3)$. Determinant: $|-4(-(x-3)) + 3(x-3) - 2(-2)| = |7x - 17|$. Given $V = 11/6 \Rightarrow |7x - 17| = 11$. Solving gives $7x = 28 \Rightarrow x = 4$.

Physics

9. **Option (B)** 2.0 A
Explanation: According to Ohm's Law, $V = IR$. Given potential difference $V = 10$ V and resistance $R = 5\Omega$. The current $I = V/R = 10/5 = 2.0$ A.

10. **Option (A)** 8×10^{-3} N
Explanation: The force on a charge in an electric field is given by $F = qE$. Given $q = 2\mu\text{C} = 2 \times 10^{-6}$ C and $E = 4 \times 10^3$ N/C. Therefore, $F = (2 \times 10^{-6})(4 \times 10^3) = 8 \times 10^{-3}$ N.

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