

SAMPLE PROBLEMS (MATHEMATICS)

1. In ΔABC minimum value of $\operatorname{cosec} A/2 + \operatorname{cosec} B/2 + \operatorname{cosec} C/2$ is
 (a) 8 (b) $\frac{9}{2}$ (c) $\frac{9}{4}$ (d) None of these
2. If $f(x) = x^2 - 2x$ $x \in \mathbb{R}$
 and $g(x) = f(f(x) - 1) + f(5 - f(x))$, then $g(x)$ belongs to
 (a) $(-4, \infty)$ (b) $[-4, \infty)$ (c) $(0, \infty)$ (d) $[0, \infty)$
3. If $f(x) = \begin{cases} x - [x] - \frac{1}{2} & \text{if } x \notin \mathbb{I} \\ 0 & \text{if } x \in \mathbb{I} \end{cases}$
 where $[x]$ denotes the greatest Integer function then total no. of point of discontinuity of $g(x) = \max. \{x^2, f(x), |x|\}$, $-2 < x < 2$ will be
 (a) 3 (b) 4 (c) 5 (d) 6
4. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ be two one-one and onto function s.t. they are the mirror images of each other about the line $y = a$. If $h(x) = f(x) + g(x)$ then $h(x)$ is
 (a) one-one and onto (b) only one-one and not onto
 (c) only onto but not one-one (d) neither one-one nor onto
5. If $f(x) = \frac{t + 3x - x^2}{x - 4}$ where t is parameter that has a minimum & maximum, then the range of values of t is
 (a) $(0, 4)$ (b) $(0, \infty)$ (c) $(-\infty, 4)$ (d) $(4, \infty)$
6. If $\int \left[\left(\frac{x}{e} \right)^x + \left(\frac{e}{x} \right)^x \right] \log dx = A \left(\frac{x}{e} \right)^x + B \left(\frac{e}{x} \right)^x + C$ then value of $A + B$ is
 (a) 2 (b) 4 (c) 5 (d) none of these
7. If the function $f: [0, 8] \rightarrow \mathbb{R}$ is differentiable, then for $0 < \alpha, \beta \leq 2$, $\int_0^8 f(t) dt$ is equal to
 (a) $3[\alpha^3 f(\alpha^2) + \beta^2 f(\beta^2)]$ (b) $3[\alpha^3 f(\alpha) + \beta^3 f(\beta)]$
 (c) $3[\alpha^2 f(\alpha^3) + \beta^2 f(\beta^3)]$ (d) $3[\alpha^2 f(\alpha^2) + \beta^2 f(\beta^2)]$
8. If the equation $z^4 + a_1 z^3 + a_2 z^2 + a_3 z + a_4 = 0$ where a_1, a_2, a_3, a_4 are real coefficient different from zero, has a purely imaginary root then the expression $a_3 / (a_1 a_2) + (a_1 a_4) / (a_2 a_3)$ has the value equal to
 (a) 0 (b) 1 (c) -2 (d) 2
9. If $1^2 + 2^2 + \dots + 2003^2 = (2003)(4007)(334)$ and $1 \cdot (2003) + 2 \cdot (2002) + \dots + (2003) \cdot 1 = (2003)(334)(x)$ then x equals
 (a) 2005 (b) 2004 (c) 2003 (d) 2001
10. If $(1 + 3 + 5 + \dots + p) + (1 + 3 + \dots + q) = (1 + 3 + 5 + \dots + r)$, where each set of parenthesis contains the sum of consecutive odd integers, then the smallest possible value of $p + q + r$, where $(p > 6)$ is
 (a) 12 (b) 21 (c) 45 (d) 54

ANSWERS
(MATHEMATICS)

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|--------|--------|--------|--------|---------|
| 1. (d) | 2. (d) | 3. (b) | 4. (d) | 5. (c) |
| 6. (d) | 7. (c) | 8. (b) | 9. (a) | 10. (b) |