# PRACTICE QUESTIONS FOR COMPETITIVE EXAMINATIONS

## SUB: MATHEMATICS

## TOPIC 4: AREA UNDER THE CURVE

1. The area of the region bounded by the curves $y = |x - 2|$ , $x = 1$ , $x = 3$ and the x-axis is -
(A) 3 (B) 2 (C) 1 (D) 4

2. The area enclosed between the curve $y = \log_e(x + e)$ and the coordinate axes is -
(A) 4 (B) 3 (C) 2 (D) 1

3. The area of the figure bounded by the curves $y = \ell nx$ & $y = (\ell nx)^2$ is -
(A) $e + 1$ (B) $e - 1$ (C) $3 - e$ (D) 1

4. Suppose $y = f(x)$ and $y = g(x)$ are two functions whose grahps intersect at three points (0, 4), (2, 2) and (4, 0) with $f(x) > g(x)$ for $0 < x < 2$ and $f(x) < g(x)$ for $2 < x < 4$.
If $\int_0^4 [f(x) - g(x)]dx = 10$ and $\int_2^4 [g(x) - f(x)]dx = 5$, the area between two curves for $0 < x < 2$, is -
(A) 5 (B) 10 (C) 15 (D) 20

5. The area bounded by the curves $y = -\sqrt{-x}$ and $x = -\sqrt{-y}$ where $x, y \le 0$
(A) cannot be determined (B) is 1/3 (C) is 2/3
(D) is same as that of the figure bounded by the curves $y = \sqrt{-x}$ ; $x \le 0$ and $x = \sqrt{-y}$ ; $y \le 0$

6. The area of the closed figure bounded by $y = x$, $y = -x$ & the tangent to the curve $y = \sqrt{x^2 - 5}$ at the point (3, 2) is -
(A) 5 (B) $2\sqrt{5}$ (C) 10 (D) $\frac{5}{2}$

7. The area of the region(s) enclosed by the curves $y = x^2$ and $y = \sqrt{|x|}$ is -
(A) 1/3 (B) 2/3 (C) 1/6 (D) 1

8. The area bounded by the curve $y = xe^{-x}$ ; $xy = 0$ and $x = c$, where c is the x-coordinate of the curve's inflection point, is -
(A) $1 - 3e^{-2}$ (B) $1 - 2e^{-2}$ (C) $1 - e^{-2}$ (D) 1

9. The area enclosed by the curves $y = \cos x$, $y = 1 + \sin 2x$ and $x = \frac{3\pi}{2}$ as x varies from 0 to $\frac{3\pi}{2}$, is -
(A) $\frac{3\pi}{2} - 2$ (B) $\frac{3\pi}{2}$ (C) $2 + \frac{3\pi}{2}$ (D) $1 + \frac{3\pi}{2}$

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10. The area enclosed by the curve $y^2 + x^4 = x^2$ is -
(A) $\frac{2}{3}$ (B) $\frac{4}{3}$ (C) $\frac{8}{3}$ (D) $\frac{10}{3}$

11. Consider two curves $C_1 : y = \frac{1}{x}$ and $C_2 : y = \ell nx$ on the xy plane. Let $D_1$ denotes the region surrounded by $C_1$, $C_2$ and the line $x = 1$ and $D_2$ denotes the region surrounded by $C_1$, $C_2$ and the line $x = a$. If $D_1 = D_2$ then the value of 'a' -
(A) $\frac{e}{2}$ (B) e (C) $e - 1$ (D) $2(e - 1)$

12. The area of the region for which $0 < y < 3 - 2x - x^2$ & $x > 0$ is -
(A) $\int_1^3 (3 - 2x - x^2)dx$ (B) $\int_0^3 (3 - 2x - x^2)dx$ (C) $\int_0^1 (3 - 2x - x^2)dx$ (D) $\int_1^3 (3 - 2x - x^2)dx$

13. The area bounded by the curves $y = x(1 - \ell nx)$ and positive x-axis between $x = e^{-1}$ and $x = e$ is -

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(A) $\left(\frac{e^2-4e^{-2}}{5}\right)$ (B) $\left(\frac{e^2-5e^{-2}}{4}\right)$ (C) $\left(\frac{4e^2-e^{-2}}{5}\right)$ (D) $\left(\frac{5e^2-e^{-2}}{4}\right)$

14. The curve $f(x) = Ax^2 + Bx + C$ passes through the point (1, 3) and line $4x + y = 8$ is tangent to it at the point (2, 0). The area enclosed by $y = f(x)$, the tangent line and the y-axis is -

(A) 4/3 (B) 8/3 (C) 16/3 (D) 32/3

15. Let $y = g(x)$ be the inverse of a bijective mapping $f : R \to R f(x) = 3x^3 + 2x$. The area bounded by graph of $g(x)$, the x-axis and the ordinate at $x = 5$ is -

(A) $\frac{5}{4}$ (B) $\frac{7}{4}$ (C) $\frac{9}{4}$ (D) $\frac{13}{4}$

16. A function $y = f(x)$ satisfies the differential equation, $\frac{dy}{dx} - y = \cos x - \sin x$, with initial condition that y is bounded when $x \to \infty$. The area enclosed by $y = f(x)$, $y = \cos x$ and the y-axis in the $1^{st}$ quadrant is-

(A) $\sqrt{2}-1$ (B) $\sqrt{2}$ (C) 1 (D) $\frac{1}{\sqrt{2}}$

17. Let 'a' be a positive constant number. Consider two curves $C_1 : y = e^x$, $C_2 : y = e^{a-x}$. Let S be the area of the part surrounding by $C_1$, $C_2$ and the y-axis, then -

(A) $\lim_{a\to\infty} S = 1$ (B) $\lim_{a\to 0} \frac{S}{a^2} = \frac{1}{4}$

(C) Range of S is $[0,\infty)$ (D) S(a) is neither odd nor even

18. Area enclosed by the curve $y = \sin x$ between $x = 2n\pi$ to $x = 2(n+1)\pi$ is-

(A) $\int_0^{2\pi} \sin x\, dx$ (B) $2\int_0^{\pi} \sin x\, dx$ (C) $4\int_0^{\pi/2} \sin x\, dx$ (D) 4

19. If (a, 0) & (b,0) [a,b > 0] are the points where the curve $y = \sin 2x - \sqrt{3}\sin x$ cuts the positive x-axis first & second time, A & B are the areas bounded by the curve & positive x-axis between x=0 to x=a and x = a to x=b respectively, then -

(A) $4A + 8\cos a = 7$ (B) $AB = \frac{1}{16}$ (C) $4A + 4B + 14\cos b = 0$ (D) $B - A = 4\cos a$

20. For which of the following values of m, is the area of the region bounded by the curve $y = x - x^2$ and the line $y = mx$ equals to 9/2 ?

(A) –4 (B) –2 (C) 2 (D) 4

| Que. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ans. | C | D | C | C | B | A | B | A | C | B |
| Que. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Ans. | B | C | B | B | D | A | A,B,C,D | B,C,D | A,B,C,D | B,D |