

PYQSide

JEE MAIN APPLICATION OF INTEGRALS — PYQS

Max. Marks: 120

Questions: 30

Section A (MCQ)

- Q.1** Let $f: (1, \infty) \rightarrow \mathbb{R}$ be a function defined as $f(x) = \frac{x-1}{x+1}$. Let $f^{i+1}(x) = f(f^i(x))$, $i = 1, 2, \dots, 25$, where $f^1(x) = f(x)$. If $g(x) + f^{26}(x) = 0$, $x \in (1, \infty)$, then the area of the region bounded by the curves $y = g(x)$, $2y = 2x-3$, $y = 0$ and $x = 4$ is :

[JEE Main 2026 (Online) 8th April Evening Shift]

- (1) $\frac{1}{8} + \log_e 2$ (2) $\frac{1}{4} + \log_e 2$
 (3) $\frac{5}{6} + 3\log_e 2$ (4) $\frac{5}{6} + \log_e 2$

Scan or tap for the full solution



- Q.2** The area of the region $\{(x, y) : 0 \leq y \leq 6-x, \text{ left. } \text{mathrm{my}} 2 \geq 4x-3, x \geq 0 \text{ right is :}$

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) 8 (2) 9 (3) 12 (4) 15

Scan or tap for the full solution



- Q.3** Let e be the base of natural logarithm and let $f: \{1, 2, 3, 4\} \rightarrow \{1, e, e^2, e^3\}$ and $g: \{1, e, e^2, e^3\} \rightarrow \left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}\right\}$ be two bijective functions such that f is strictly decreasing and g is strictly increasing. If $\phi(x) = \left[f^{-1}\left\{g^{-1}\left(\frac{1}{2}\right)\right\}\right]^x$, then the area of the region $R = \{(x, y) : x^2 \leq y \leq \phi(x), \text{ left. } 0 \leq x \leq 1 \text{ right is :}$

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) $\frac{3 - \log_e(2)}{3\log_e(2)}$ (2) $\frac{1}{3\log_e(2)}$
 (3) $3 + \log_e(2)$ (4) $\frac{3 + \log_e(2)}{2 + \log_e(3)}$

Scan or tap for the full solution



- Q.4** The area of the region $\{(x, y) : x^2 - 8x \leq y \leq -x\}$ is :

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) $\frac{343}{6}$ (2) $\frac{637}{6}$ (3) $\frac{437}{6}$ (4) $\frac{523}{6}$

Scan or tap for the full solution



- Q.5** The area of the region $R = \{(x, y) : xy \leq 27, 1 \leq y \leq x^2\}$ is equal to :

[JEE Main 2026 (Online) 5th April Morning Shift]

- (1) $78\log_e 3 - \frac{52}{3}$ (2) $54\log_e 3 - \frac{52}{3}$
 (3) $54\log_e 3 - \frac{26}{3}$ (4) $54\log_e 3 + \frac{26}{3}$

Scan or tap for the full solution



- Q.6** The area of the region $\{(x, y) : y \leq \pi - |x|, y \leq |x \sin x|, y \geq 0\}$ is :

[JEE Main 2026 (Online) 4th April Morning Shift]

- (1) $1 + \frac{\pi^2}{8}$ (2) $2 + \frac{\pi^2}{4}$ (3) $\frac{\pi^2}{8} - 1$ (4) $4 + \frac{\pi^2}{2}$

Scan or tap for the full solution



- Q.7** The area of the region bounded by the curves $x + 3y^2 = 0$ and $x + 4y^2 = 1$ is equal to :

[JEE Main 2026 (Online) 4th April Evening Shift]

- (1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{4}{3}$ (4) $\frac{5}{3}$

Scan or tap for the full solution



- Q.8** The area of the region $R = \{(x, y) : xy \leq 8, 1 \leq y \leq x^2, x \geq 0\}$ is

[JEE Main 2026 (Online) 28th January Morning Shift]

- (1) $\frac{2}{3}(20\log_e(2) + 9)$ (2) $\frac{1}{3}(40\log_e(2) + 27)$
 (3) $\frac{1}{3}(49\log_e(2) - 15)$ (4) $\frac{2}{3}(24\log_e(2) - 7)$

Scan or tap for the full solution



- Q.9** Let $P_1: y = 4x^2$ and $P_2: y = x^2 + 27$ be two parabolas. If the area of the bounded region enclosed between P_1 and P_2 is six times the area of the bounded region enclosed between the line $y = \alpha x$, $\alpha > 0$ and P_1 , then α is equal to :

[JEE Main 2026 (Online) 28th January Evening Shift]

- (1) 12 (2) 15 (3) 8 (4) 6

Scan or tap for the full solution



Q.10 Let A_1 be the bounded area enclosed by the curves $y = x^2 + 2$, $x + y = 8$ and y -axis that lies in the first quadrant. Let A_2 be the bounded area enclosed by the curves $y = x^2 + 2$, $y^2 = x$, $x = 2$, and y -axis that lies in the first quadrant. Then $A_1 - A_2$ is equal to

[JEE Main 2026 (Online) 24th January Morning Shift]

- (1) $\frac{2}{3}(2\sqrt{2} + 1)$ (2) $\frac{2}{3}(3\sqrt{2} + 1)$
 (3) $\frac{2}{3}(\sqrt{2} + 1)$ (4) $\frac{2}{3}(4\sqrt{2} + 1)$

Scan or tap for the full solution 

Q.11 Let $f(\alpha)$ denote the area of the region in the first quadrant bounded by $x = 0$, $x = 1$, $y^2 = x$ and $y = |\alpha x - 5| - |1 - \alpha x| + \alpha x^2$. Then $(f(0) + f(1))$ is equal to

[JEE Main 2026 (Online) 24th January Evening Shift]

- (1) 12 (2) 14 (3) 9 (4) 7

Scan or tap for the full solution 

Q.12 The area of the region enclosed between the circles $x^2 + y^2 = 4$ and $x^2 + (y - 2)^2 = 4$ is:

[JEE Main 2026 (Online) 23rd January Evening Shift]

- (1) $\frac{2}{3}(4\pi - 3\sqrt{3})$ (2) $\frac{4}{3}(2\pi - \sqrt{3})$
 (3) $\frac{4}{3}(2\pi - 3\sqrt{3})$ (4) $\frac{2}{3}(2\pi - 3\sqrt{3})$

Scan or tap for the full solution 

Q.13 Let the line $x = -1$ divide the area of the region $\{(x, y) : 1 + x^2 \leq y \leq 3 - x\}$ in the ratio $m : n$, $\gcd(m, n) = 1$. Then $m + n$ is equal to

[JEE Main 2026 (Online) 22nd January Morning Shift]

- (1) 27 (2) 28 (3) 25 (4) 26

Scan or tap for the full solution 

Q.14 The area of the region $A = \{(x, y) : 4x^2 + y^2 \leq 8 \text{ and } y^2 \leq 4x\}$ is:

[JEE Main 2026 (Online) 22nd January Evening Shift]

- (1) $\pi + \frac{2}{3}$ (2) $\frac{\pi}{2} + 2$ (3) $\pi + 4$ (4) $\frac{\pi}{2} + \frac{1}{3}$

Scan or tap for the full solution 

Q.15 The area of the region, inside the ellipse $x^2 + 4y^2 = 4$ and outside the region bounded by the curves $y = |x| - 1$ and $y = 1 - |x|$, is :

[JEE Main 2026 (Online) 21st January Morning Shift]

- (1) $2\pi - 1$ (2) $3(\pi - 1)$ (3) $2(\pi - 1)$ (4) $2\pi - \frac{1}{2}$

Scan or tap for the full solution 

Q.16 If the area of the region $\{(x, y) : 1 - 2x \leq y \leq 4 - x^2, x \geq 0, y \geq 0\}$ is $\frac{\alpha}{\beta}$, $\alpha, \beta \in \mathbb{N}$, $\gcd(\alpha, \beta) = 1$, then the value of $(\alpha + \beta)$ is:

[JEE Main 2026 (Online) 21st January Evening Shift]

- (1) 73 (2) 85 (3) 67 (4) 91

Scan or tap for the full solution 

Q.17 If the area of the region bounded by the curves $y = 4 - \frac{x^2}{4}$ and $y = \frac{x-4}{2}$ is equal to α , then 6α equals

[JEE Main 2025 (Online) 7th April Morning Shift]

- (1) 210 (2) 250 (3) 240 (4) 220

Scan or tap for the full solution 

Q.18 If the area of the region $\{(x, y) : 1 + x^2 \leq y \leq \min\{x + 7, 11 - 3x\}\}$ is A , then $3A$ is equal to :

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) 50 (2) 46 (3) 49 (4) 47

Scan or tap for the full solution 

Q.19 A line passing through the point $A(-2, 0)$ touches the parabola $P: y^2 = x - 2$ at the point B in the first quadrant. The area of the region bounded by the line AB , parabola P and the x -axis, is :

[JEE Main 2025 (Online) 4th April Evening Shift]

- (1) 3 (2) $\frac{7}{3}$ (3) $\frac{8}{3}$ (4) 2

Scan or tap for the full solution 

Q.20 The area of the region $\{(x, y) : |x - y| \leq y \leq 4\sqrt{x}\}$ is

[JEE Main 2025 (Online) 3rd April Evening Shift]

- (1) $\frac{512}{3}$ (2) $\frac{2048}{3}$ (3) 512 (4) $\frac{1024}{3}$

Scan or tap for the full solution 

Q.21 Let the area of the region $\{(x, y) : 2y \leq x^2 + 3, y + |x| \leq 3, y \geq |x - 1|\}$ be A . Then $6A$ is equal to :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) 14 (2) 18 (3) 16 (4) 12

Scan or tap for the full solution 

Q.22 The area (in sq. units) of the region $\{(x, y) : 0 \leq y \leq 2|x| + 1, 0 \leq y \leq x^2 + 1, |x| \leq 3\}$ is

[JEE Main 2025 (Online) 28th January Morning Shift]

- (1) $\frac{32}{3}$ (2) $\frac{64}{3}$ (3) $\frac{17}{3}$ (4) $\frac{80}{3}$

Scan or tap for the full solution 

- Q.23** The area of the region bounded by the curves $x(1 + y^2) = 1$ and $y^2 = 2x$ is:

[JEE Main 2025 (Online) 28th January Evening Shift]

- (1) $\frac{\pi}{4} - \frac{1}{3}$ (2) $\frac{\pi}{2} - \frac{1}{3}$
 (3) $2\left(\frac{\pi}{2} - \frac{1}{3}\right)$ (4) $\frac{1}{2}\left(\frac{\pi}{2} - \frac{1}{3}\right)$

Scan or tap for the full solution



Section B (Numerical)

- Q.24** Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function such that $f(x) + 3f\left(\frac{\pi}{2} - x\right) = \sin x$, $x \in \mathbb{R}$. Let the maximum value of f on $\mathbb{R}$ be α . If the area of the region bounded by the curves $g(x) = x^2$ and $h(x) = \beta x^3$, $\beta > 0$, is α^2 , then $30\beta^3$ is equal to _____.

[JEE Main 2026 (Online) 5th April Evening Shift]

Scan or tap for the full solution



- Q.25** If the area of the region bounded by $16x^2 - 9y^2 = 144$ and $8x - 3y = 24$ is A , then $3(A + 6\log_e(3))$ is equal to _____.

[JEE Main 2026 (Online) 2nd April Evening Shift]

Scan or tap for the full solution



- Q.26** Let the area of the region bounded by the curve $y = \max\{\sin x, \cos x\}$, lines $x = 0$, $x = \frac{3\pi}{2}$, and the x -axis be A . Then, $A + A^2$ is equal to _____.

[JEE Main 2026 (Online) 23rd January Morning Shift]

Scan or tap for the full solution



- Q.27** Let the area of the bounded region $\{(x, y) : 0 \leq 9x \leq y^2, y \geq 3x - 6\}$ be A . Then $6A$ is equal to _____.

[JEE Main 2025 (Online) 8th April Evening Shift]

Scan or tap for the full solution



- Q.28** If the area of the region $\{(x, y) : |x - 5| \leq y \leq 4\sqrt{x}\}$ is A , then $3A$ is equal to _____.

[JEE Main 2025 (Online) 4th April Morning Shift]

Scan or tap for the full solution



- Q.29** The area of the region bounded by the curve $y = \max\{|x|, x|x - 2|\}$, the x -axis and the lines $x = -2$ and $x = 4$ is equal to _____.

[JEE Main 2025 (Online) 3rd April Morning Shift]

Scan or tap for the full solution



- Q.30** If the area of the region $\{(x, y) : |4 - x^2| \leq y \leq x^2, y \leq 4, x \geq 0\}$ is $\left(\frac{80\sqrt{2}}{\alpha} - \beta\right)$, $\alpha, \beta \in \mathbb{N}$, then $\alpha + \beta$ is equal to _____.

[JEE Main 2025 (Online) 2nd April Morning Shift]

Scan or tap for the full solution



ANSWER KEY

Section A (MCQ)

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	1	2	1	1	2	2	3	4	1	1	4
Ques.	12	13	14	15	16	17	18	19	20	21	22
Ans.	1	1	1	3	1	2	1	3	4	1	2
Ques.	23										
Ans.	2										

Section B (Numerical)

Ques.	24	25	26	27	28	29	30
Ans.	16	24	12	15	368	12	22