EXERCISE - O

SINGLE CORRECT TYPE QUESTIONS

1. The area bounded by the curve $y = \ell n(x)$ and the lines $y = 0, y = \ell n(3)$ and $x = 0$ is equal to :

(A) $3\ \ell n\ (3) - 2$ (B) 3 (C) 2 (D) $3\ \ell n\ (3) + 2$

MAU002

2. Suppose $y = f(x)$ and $y = g(x)$ are two functions whose graphs intersect at the 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

MAU003

3. 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 $\lim_{a \to 0} \frac{S}{a^2}$ equals

(A) 4 (B) 1/2 (C) 0 (D) 1/4

MAU004

4. The area bounded by the curves $y = x(x-3)^2$ and $y = x$ is (in sq. units) :

(A) 28 (B) 32 (C) 4 (D) 8

MAU006

5. The curve $y = ax^2 + bx + c$ passes through the point (1, 2) and its tangent at origin is the line $y = x$. The area bounded by the curve, the ordinate of the curve at minima and the tangent line is

(A) $\frac{1}{24}$ (B) $\frac{1}{12}$ (C) $\frac{1}{8}$ (D) $\frac{1}{6}$

MAU007

6. The area bounded by the curve $y = x\,e^{-x}$; $xy = 0$ 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

MAU008

7. Let the straight line $x = b$ divide the area enclosed by $y = (1-x)^2$, $y = 0$ and $x = 0$ into two parts $R_1(0 \le x \le b)\,d$ and $R_2(b \le x \le 1)$ such that $R_1 - R_2 = \frac{1}{4}$. Then b equals

(A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{1}{4}$

MAU011

8. Area enclosed by the curve $y = f(x)$ defined parametrically as $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$ is equal to

(A) π sq. units (B) $\frac{\pi}{2}$ sq. units (C) $\frac{3\pi}{4}$ sq. units (D) $\frac{3\pi}{2}$ sq. units

MAU012

9. The area bounded by the curve $a^2y = x^2(x + a)$ and the x-axis is

(A) $\frac{a^2}{3}$ sq. units (B) $\frac{a^2}{4}$ sq. units (C) $\frac{3a^2}{4}$ sq. units (D) $\frac{a^2}{12}$ sq. units

MAU013

10. If area bounded by $y = \frac{a}{4+x^2}$ $(a > 0)$ and $y = c(c \le 0)$ is an even prime integer, then $[a] + [c]$ is equal to (where [.] denotes greatest integer function) -

(A) 1 (B) 0 (C) −1 (D) 3

MAU015

MULTIPLE CORRECT TYPE QUESTIONS

11. Suppose f is defined from $R \to [-1, 1]$ as $f(x) = \frac{x^2-1}{x^2+1}$ where R is the set of real number. Then the statement which does not hold is

(A) f is many one onto

(B) f increases for $x > 0$ and decrease for $x < 0$

(C) minimum value is not attained even though f is bounded

(D) the area included by the curve $y = f(x)$ and the line $y = 1$ is π sq. units.

MAU037

12. Which of the following statement(s) is/are True for the function $f(x) = (x - 1)^2(x - 2) + 1$ defined on [0, 2] ?

(A) Range of f is $\left[\frac{23}{27}, 1\right]$.

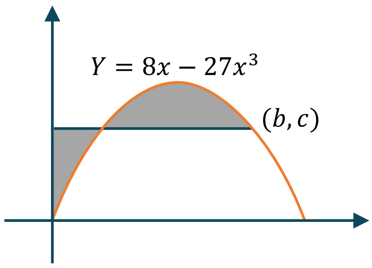
(B) The coordinates of the turning point of the graph of $y = f(x)$ occur at (1, 1) and $\left(\frac{5}{3}, \frac{23}{27}\right)$.

(C) The value of p for which the equation $f(x) = p$ has 3 distinct solutions lies in interval $\left(\frac{23}{27}, 1\right)$

(D) The area enclosed by $y = f(x)$, the lines $x = 0$ and $y = 1$ as x varies from 0 to 1 is $\frac{7}{12}$.

MAU039

13. The figure shows a horizontal line $y = c$ passing through (b, c) intersecting the curve $y = 8x - 27x^3$. If the shaded areas are equal, then



(A) $b = \frac{1}{9}$ (B) $b = \frac{4}{9}$ (C) $c = \frac{32}{27}$ (D) $c = \frac{23}{27}$

MAU042

14. If A_1 denotes area of the region bounded by the curves $C_1: y = (x-1)e^x$, tangent to C_1 at (1,0) & y −axis and A_2 denotes the area of the region bounded by C_1 and co-ordinate axes in fourth quadrant, then -

(A) $A_1 > A_2$ (B) $A_1 < A_2$ (C) $2A_1 + A_2 = 2$ (D) $A_1 + 2A_2 = 4$

MAU043

15. Area bounded by $y = \sec^{-1} x, y = \cot^{-1} x$ and line $x = 1$ is given by -

(A) $\int_1^{\sqrt{\frac{1+\sqrt{5}}{2}}} \left(\cot^{-1} x - \sec^{-1} x\right) dx$

(B) $\int_0^{\alpha} \sec x\, dx + \int_{\alpha}^{\pi/4} \cot x\, dx - \frac{\pi}{4}$, where $\sin\alpha = \cos^2\alpha$

(C) $\int_0^{\alpha} \sec x\, dx + \int_{\alpha}^{\pi/4} \cot x\, dx - \frac{\pi}{4} + 1$, where $\sin\alpha = \cos^2\alpha$

(D) $\int_1^{\frac{1+\sqrt{5}}{2}} \left(\cot^{-1} x - \sec^{-1} x\right) dx$

MAU044

16. Area bounded by the curve $y = \cot x, x = \frac{\pi}{4}$ and $y = 0$ is -

(A) $\int_0^{\pi/4} \tan\left(\frac{\pi}{4} - x\right) dx$ (B) $\frac{\pi}{4} - \int_0^1 \tan^{-1} x dx$ (C) $1 - \int_0^1 \tan^{-1} x dx$ (D) $\int_0^{\pi.4} \tan^{-1} x dx$

MAU045

17. If the curve $y = ax^{\frac{1}{2}} + bx$ passes through the point (1, 2) and lies above the x −axis for $0 \le x \le 9$ and the area enclosed by the curve, the x-axis, and the lines $x = 1$ and $x = 4$ is 8 sq. units, then

(A) $a = 1$ (B) $b = 1$ (C) $a = 3$ (D) $b = -1$

MAU046

18. Which of the following is the possible value/values of c for which the area of the figure bounded by the curves $y = \sin 2x$, the straight lines $x = \frac{\pi}{6}$, $x = c$ and the abscissa axis is equal to 1/2 ?

(A) $-\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) none of these

MAU047

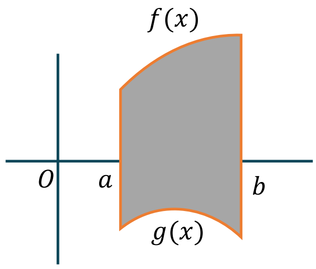
19. Which of the following is/are area of shaded region –

(A) $\int_a^b |f(x) - g(x)| dx$

(B) $\int_a^b \left(|f(x)| - |g(x)|\right) dx$

(C) $\int_a^b \left(|f(x)| + |g(x)|\right) dx$

(D) $\int_a^b |f(x) + g(x)| dx$



MAU048

20. 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

MAU049

21. If area enclosed by the graph of function $y = \ell n(x+1)$, y-axis and the line $y = 1$ is A, then choose correct option(s)-

(where [.] and {.} denotes greatest integer function and fractional part function respectively)

(A) $\{A\} = e - 2$
(B) $[A] = 1$
(C) $[A] = 0$
(D) $[-A] = -1$

MAU050

COMPREHENSION TYPE QUESTIONS

Paragraph for Question No. 22 to 24

Consider the curve $x = y^4 - 5y^2 + 4$. It represents following two explicit functions :

$$f : \left[-\frac{9}{4}, 4\right] \to \left[0, \sqrt{\frac{5}{2}}\right] \ ; \ y = f(x)$$

$$g : \left[-\frac{9}{4}, \infty\right) \to \left[\sqrt{\frac{5}{2}}, \infty\right) \ ; \ y = g(x)$$

Let A_1 be area bounded by $y = f(x)$ & $xy = 0$ as x varies from 0 to 4.

A_2 be area bounded by $y = g(x)$, $x^2 - 16x + 63 = 0$ & $y = 0$.

A_3 be the area bounded by tangent to the curve $y = f(x)$ at $P(-2, \sqrt{2})$ and co-ordinate axes.

On the basis of above information answer the following :

22. A_1 is equal to :-

(A) $\frac{38}{15}$
(B) $\frac{36}{15}$
(C) $\frac{88}{15}$
(D) 3

MAU052

23. A_2 is equal to :-

(A) $\int_7^9 \frac{xdx}{2g(x)(2g^2(x)-5)} + 9g(9) - 7g(7)$
(B) $9g(9) - 7g(7) - \int_7^9 \frac{xdx}{2g(x)(2g^2(x)-5)}$
(C) $\int_7^9 \frac{xdx}{2g(x)(5-2g^2(x))} - 9g(9) + 7g(7)$
(D) none

MAU053

24. A_3 is equal to :-

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

MAU054

MATCHING LIST TYPE QUESTION

25.

	List-I		List–II
(I)	The area bounded by the curve $x = 3y^2 - 9$ and the lines $x = 0, y = 0$ and $y = 1$ in square units is equal to	(P)	1
(II)	If a curve $f(x) = a\sqrt{x} + bx$, $(f(x) \geq 0 \ \forall \ x \in [0, 9])$ passes through the point (1, 2) and the area bounded by the curve, line $x = 4$ and x-axis is 8 square unit, then $2a + b$ is equal to	(Q)	4
(III)	The area enclosed between the curves $y = \sin^2 x$ and $y = \cos^2 x$ in the interval $0 \leq x \leq \pi$ in square units in equal to	(R)	8
(IV)	The area bounded by the curve $y^2 = 16x$ and line $y = mx$ is $\frac{2}{3}$ square units, then m is equal to	(S)	5

(A) I $\rightarrow$ S; II $\rightarrow$ P; III $\rightarrow$ Q; IV $\rightarrow$ R

(B) I $\rightarrow$ R; II $\rightarrow$ S; III $\rightarrow$ P; IV $\rightarrow$ Q

(C) I $\rightarrow$ S; II $\rightarrow$ R; III $\rightarrow$ P; IV $\rightarrow$ Q

(D) I $\rightarrow$ R; II $\rightarrow$ S; III $\rightarrow$ Q; IV $\rightarrow$ P

MAU055

EXERCISE - S

1. The area of the region $A=\left[(x,y):0\le y\le x|x|+1 \text{ and } -1\le x\le 1\right]$ in sq. units, is :

MAU016

2. The area (in sq. units) of the region $A=\{(x,y):\frac{y^2}{2}\le x\le y+4\}$ is :

MAU017

3. If the area (in sq. units) bounded by the parabola $y^2=4\lambda x$ and the line y = λx, $\lambda > 0$, is $\frac{1}{9}$, then λ is equal to :

MAU018

4. Find the area (in sq. units) enclosed between the curves : $y=\log_e(x+e)$, $x=\log_e(1/y)$ & the x-axis.

MAU019

5. Let 'c' be the constant number such that $c>1$. If the least area of the figure given by the line passing through the point $(1,c)$ with gradient 'm' and the parabola $y=x^2$ is 36 sq. units find the value of (c^2+m^2).

MAU020

6. Area bounded by lines $y=2+x$, $y=2-x$ and $x=2$ is

MAU065

7. The area of smaller part between the circle $x^2+y^2=4$and the line $x=1$ is

MAU066

8. The area enclosed between the curves $y=\sin^2x$ and $y=\cos^2x$ in the interval $0\le x\le \pi$ is

MAU067

9. The area of the region(s) enclosed by the curve $y=x^2$ and $y=\sqrt{|x|}$ is

MAU068

10. If A is the area bounded by the curves $y=\sqrt{1-x^2}$ and $y=x^3-x$. then the value of π/A is.

MAU069

EXERCISE - JEE (Main) PYQ

1. The area (in sq. units) of the region bounded by the curves $y = 2^x$ and $y = |x+1|$, in the first quadrant is : **[JEE Main 2019]**

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

MAU026

2. If the area (in sq. units) of the region $\{(x,y): y^2 \le 4x, x+y \le 1, x \ge 0, y \ge 0\}$ is $a\sqrt{2}+b$, then $a-b$ is equal to : **[JEE Main 2019]**

(1) $\frac{8}{3}$ (2) $\frac{10}{3}$ (3) 6 (4) $-\frac{2}{3}$

MAU027

3. The area (in sq. units) of the region $\{(x,y) \in R^2 | 4x^2 \le y \le 8x+12)$ is : **[JEE Main 2020]**

(1) $\frac{127}{3}$ (2) $\frac{125}{3}$ (3) $\frac{124}{3}$ (4) $\frac{128}{3}$

MAU028

4. Given : $f(x) = \begin{cases} x & , 0 \le x < \frac{1}{2} \\ \frac{1}{2} & , x = \frac{1}{2} \\ 1-x & , \frac{1}{2} < x \le 1 \end{cases}$ and $g(x) = \left(x-\frac{1}{2}\right)^2$, $x \in R$. Then the area (in sq. units) of the region bounded by the curves, $y = f(x)$ and $y = g(x)$ between the lines, $2x = 1$ and $2x = \sqrt{3}$, is : **[JEE Main 2020]**

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

MAU029

5. The area of the region : $R = \{(x,y): 5x^2 \le y \le 2x^2+9\}$ is : **[JEE Main 2021]**

(1) $11\sqrt{3}$ square units (2) $12\sqrt{3}$ square units

(3) $9\sqrt{3}$ square units (4) $6\sqrt{3}$ square units

MAU030

6. The graphs of sine and cosine functions, intersect each other at a number of points and between two consecutive points of intersection, the two graphs enclose the same area A. Then A^4 is equal to. **[JEE Main 2021]**

MAU031

7. Let A_1 be the area of the region bounded by the curves $y = \sin x$, $y = \cos x$ and y –axis in the first quadrant. Also, let A_2 be the area of the region bounded by the curves $y = \sin x$, $y = \cos x$, x –axis and $x = \frac{\pi}{2}$ in the first quadrant. Then, **[JEE Main 2021]**

(1) $A_1 : A_2 = 1 : \sqrt{2}$ and $A_1 + A_2 = 1$ (2) $A_1 = A_2$ and $A_1 + A_2 = \sqrt{2}$

(3) $2A_1 = A_2$ and $A_1 + A_2 = 1+\sqrt{2}$ (4) $A_1 : A_2 = 1:2$ and $A_1 + A_2 = 1$

MAU032

8. Let S be the region bounded by the curves $y = x^3$ and $y^2 = x$. The curve $y = 2|x|$ divides S into two regions of areas R_1 and R_2. If $\max\{R_1, R_2\} = R_2$, then $\frac{R_2}{R_1}$ is equal to ____. **[JEE Main 2022]**

MAU033

9. The area bounded by the curve $y = |x^2 - 9|$ and the line $y = 3$ is : **[JEE Main 2022]**

(1) $4(2\sqrt{3}+\sqrt{6}-4)$ (2) $4(4\sqrt{3}+\sqrt{6}-4)$ (3) $8(4\sqrt{3}+3\sqrt{6}-9)$ (4) $8(4\sqrt{3}+2\sqrt{6}-9)$

MAU035

10. Let A be the area bounded by the curve $y = x\,|x - 3|$, the x-axis and the ordinates $x = -1$ and $x = 2$. Then $12A$ is equal to ____. **[JEE Main-2023]**

MAU070

11. The area of the region given by $\{(x, y) : xy \le 8, 1, \le y \le x^2\}$ is : **[JEE Main-2023]**

(1) $8\log_e 2 - \frac{13}{3}$ (2) $16\log_e 2 - \frac{14}{3}$ (3) $8\log_e 2 + \frac{7}{6}$ (4) $16\log_e 2 + \frac{7}{3}$

MAU071

12. If the area of the region bounded by the curves $y^2 - 2y = -x$, $x + y = 0$ is A, then $8A$ is equal to **[JEE Main-2023]**

MAU072

13. The area enclosed by the curves $y^2 + 4x = 4$ and $y - 2x = 2$ is : **[JEE Main-2023]**

(1) $\frac{25}{3}$ (2) $\frac{22}{3}$ (3) 9 (4) $\frac{23}{3}$

MAU073

14. Let T and C respectively be the transverse and conjugate axes of the hyperbola $16x^2 - y^2 + 64x + 4y + 44 = 0$. Then the area of the region above the parabola $x^2 = y + 4$, below the transverse axis T and on the right of the conjugate axis C is: **[JEE Main-2023]**

(1) $4\sqrt{6}+\frac{44}{3}$ (2) $4\sqrt{6}+\frac{28}{3}$ (3) $4\sqrt{6}-\frac{44}{3}$ (4) $4\sqrt{6}-\frac{28}{3}$

MAU074

15. It the area enclosed by the parabolas $P_1 : 2y = 5x^2$ and $P_2 : x^2 - y + 6 = 0$ is equal to the area enclosed by P_1 and $y = \alpha x, \alpha > 0$, then α^3 is equal to ____. **[JEE Main-2023]**

MAU075

16. The area of the region $A = \left\{(x, y) : |\cos x - \sin x| \le y \le \sin x, 0 \le x \le \frac{\pi}{2}\right\}$ **[JEE Main-2023]**

(1) $1-\frac{3}{\sqrt{2}}+\frac{4}{\sqrt{5}}$ (2) $\sqrt{5}+2\sqrt{2}-4.5$ (3) $\frac{3}{\sqrt{5}}-\frac{3}{\sqrt{2}}+1$ (4) $\sqrt{5}-2\sqrt{2}+1$

MAU076

17. Let $A=\left\{(x,y)\in\mathbb{R}^2 : y\ge 0, 2x\le y\le\sqrt{4-(x-1)^2}\right\}$ and $B=\left\{(x,y)\in\mathbb{R}\times\mathbb{R} : 0\le y\le\min\left\{2x,\sqrt{4-(x-1)^2}\right\}\right\}$

Then the ratio of the area of A to the area of B is **[JEE Main-2023]**

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

MAU077

18. Let Δ be the area of the region $\{(x,y)\in\mathbb{R}^2 : x^2+y^2\le 21, y^2\le 4x, x\ge 1\}$. Then $\frac{1}{2}\left(\Delta-21\sin^{-1}\frac{2}{\sqrt{7}}\right)$ is equal to **[JEE Main-2023]**

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

MAU078

EXERCISE - JEE (Advanced) PYQ

1. The area enclosed by the curve $y = \sin x + \cos x$ and $y = |\cos x - \sin x|$ over the interval $\left[0, \frac{\pi}{2}\right]$ is

[JEE (Advanced) 2013]

(A) $4(\sqrt{2}-1)$ (B) $2\sqrt{2}(\sqrt{2}-1)$ (C) $2(\sqrt{2}+1)$ (D) $2\sqrt{2}(\sqrt{2}+1)$

MAU056

2. Let $F(x) = \int_{x}^{x^2+\frac{\pi}{6}} 2\cos^2 t\,dt$ for all $x \in \mathbb{R}$ and $f : \left[0, \frac{1}{2}\right] \to [0, \infty)$ be a continuous function. For $a \in \left[0, \frac{1}{2}\right]$, if $F'(a) + 2$ is the area of the region bounded by $x = 0$, $y = 0$, $y = f(x)$ and $x = a$, then $f(0)$ is

[JEE (Advanced) 2015]

MAU057

3. If the line $x = \alpha$ divides the area of region $R = \{(x, y) \in \mathbb{R}^2 : x^3 \le y \le x, 0 \le x \le 1\}$ into two equal parts, then

[JEE (Advanced) 2017]

(A) $\frac{1}{2} < \alpha < 1$ (B) $\alpha^4 + 4\alpha^2 - 1 = 0$ (C) $0 < \alpha \le \frac{1}{2}$ (D) $2\alpha^4 - 4\alpha^2 + 1 = 0$

MAU058

4. Let $f : [0, \infty) \to \mathbb{R}$ be a continuous function such that $f(x) = 1 - 2x + \int_0^x e^{x-t} f(t)\,dt$ for all $x \in [0, \infty)$. Then, which of the following statement(s) is (are) TRUE ?

[JEE (Advanced) 2018]

(A) The curve $y = f(x)$ passes through the point $(1, 2)$

(B) The curve $y = f(x)$ passes through the point $(2, -1)$

(C) The area of the region $\{(x, y) \in [0, 1] \times \mathbb{R} : f(x) \le y \le \sqrt{1-x^2}\}$ is $\frac{\pi-2}{4}$

(D) The area of the region $\{(x, y) \in [0, 1] \times \mathbb{R} : f(x) \le y \le \sqrt{1-x^2}\}$ is $\frac{\pi-1}{4}$

MAU059

5. A farmer F_1 has a land in the shape of a triangle with vertices at $P(0, 0)$, $Q(1, 1)$ and $R(2, 0)$. From this land, a neighbouring farmer F_2 takes away the region which lies between the side PQ and a curve of the form $y = x^n (n > 1)$. If the area of the region taken away by the farmer F_2 is exactly 30% of the area of ΔPQR, then the value of n is _____

[JEE (Advanced) 2018]

MAU060

6. The area of the region $\{(x, y) : xy \le 8, 1 \le y \le x^2\}$ is

[JEE (Advanced) 2019]

(A) $8\log_e 2 - \frac{14}{3}$ (B) $16\log_e 2 - \frac{14}{3}$ (C) $16\log_e 2 - 6$ (D) $8\log_e 2 - \frac{7}{3}$

MAU061

7. Let the functions $f:\mathbb{R}\to\mathbb{R}$ and $g:\mathbb{R}\to\mathbb{R}$ be defined by

$f(x) = e^{x-1} - e^{-|x-1|}$ and $g(x)=\frac{1}{2}\left(e^{x-1}+e^{1-x}\right)$.

Then the area of the region in the first quadrant bounded by the curves $y = f(x)$, $y = g(x)$ and $x = 0$ is **[JEE (Advanced) 2020]**

(A) $\left(2-\sqrt{3}\right)+\frac{1}{2}(e-e^{-1})$
(B) $\left(2+\sqrt{3}\right)+\frac{1}{2}(e-e^{-1})$
(C) $\left(2-\sqrt{3}\right)+\frac{1}{2}(e+e^{-1})$
(D) $\left(2+\sqrt{3}\right)+\frac{1}{2}(e+e^{-1})$

MAU062

8. The area of the region $\left\{(x,y):0\le x\le\frac{9}{4},\quad 0\le y\le 1,\quad x\ge 3y,\quad x+y\ge 2\right\}$ is **[JEE (Advanced) 2021]**

(A) $\frac{11}{32}$ (B) $\frac{35}{96}$ (C) $\frac{37}{96}$ (D) $\frac{13}{32}$

MAU063

9. Consider the functions $f, g:\mathbb{R}\to\mathbb{R}$ defined by

$$f(x) = x^2+\frac{5}{12}\quad \text{and } g(x)=\begin{cases}2\left(1-\frac{4|x|}{3}\right), & |x|\le\frac{3}{4},\\ 0, & |x|>\frac{3}{4}.\end{cases}$$

If α is the area of the region

$\left\{(x,y)\in\mathbb{R}\times\mathbb{R}:|x|\le\frac{3}{4},0\le y\le\min\{f(x),g(x)\}\right\}$,

then the value of 9α is _____. **[JEE (Advanced) 2022]**

MAU064

10. Let $f:[0, 1]\to[0, 1]$ be the function defined by $f(x)=\frac{x^3}{3}-x^2+\frac{5}{9}x+\frac{17}{36}$. Consider the square region $S = [0, 1]\times[0,1]$. Let $G = \{(x,y)\in S : y > f(x)\}$ be called the green region and $R =\{(x,y)\in S : y < f(x)\}$ be called the red region. Let $L_h = \{(x,h)\in S : x\in[0, 1]\}$ be the horizontal line drawn at a height $h\in[0, 1]$. Then which of the following statements is(are) ture?

[JEE (Advanced) 2023]

(A) There exists an $h\in\left[\frac{1}{4},\frac{2}{3}\right]$ such that the area of the green region above the line L_h equals the area of the green region below the line L_h

(B) There exists an $h\in\left[\frac{1}{4},\frac{2}{3}\right]$ such that the area of the red region above the line L_h equals the area of the red region below the line L_h

(C) There exists an $h\in\left[\frac{1}{4},\frac{2}{3}\right]$ such that the area of the green region above the line L_h equals the area of the red region below the line L_h

(D) There exists an $h\in\left[\frac{1}{4},\frac{2}{3}\right]$ such that the area of the red region above the line L_h equals the area of the green region below the line L_h

MAU079

11. Let $n \geq 2$ be a natural number and $f : [0,1] \to \mathbb{R}$ be the function defined by

$$f(x)=\begin{cases} n(1-2nx) & \text{if } 0 \leq x \leq \dfrac{1}{2n} \\ 2n(2nx-1) & \text{if } \dfrac{1}{2n} \leq x \leq \dfrac{3}{4n} \\ 4n(1-nx) & \text{if } \dfrac{3}{4n} \leq x \leq \dfrac{1}{n} \\ \dfrac{n}{n-1}(nx-1) & \text{if } \dfrac{1}{n} \leq x \leq 1 \end{cases}$$

If n is such that the area of the region bounded by the curves $x = 0$, $x = 1$, $y = 0$ and $y = f(x)$ is 4 , then the maximum value of the function f is

[JEE (Advanced) 2023]

MAU080

JEE (Main) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION–A

- This section contains **TWENTY** questions.
- Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

Full Marks : +4, if only the bubble corresponding to the correct option is darkened.
Zero Marks : 0, if none of the bubbles is darkened.
Negative Marks : –1 in all other cases.

1. The area bounded by the curve $y = tan\,x\,, x = \frac{\pi}{4}\,, x = \frac{\pi}{3}$, and x-axis is

(1) $\frac{\ell n2}{2}$ (2) $\ell n2$ (3) $\frac{2}{3}\,\ell n2$ (4) $\frac{3}{2}\,\ell n2$

MAU081

2. The area bounded by curve $y = x^3, y = -1, y = 8$ and y-axis is

(1) $\frac{45}{4}$ (2) $\frac{4}{45}$ (3) $\frac{51}{4}$ (4) $\frac{47}{4}$

MAU082

3. The area bounded by the parabola $y = 4x^2, x = 0$ and $y = 1, y = 4$ is

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

MAU083

4. The area bounded by the curve $x^2 = 4y$, x-axis and the line $x = 2$ is

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

MAU084

5. Area under the curve $y = x^2 - 4x$ within the x − axis and the line $x = 2$, is

(1) $\frac{16}{3}$ sq. unit (2) $-\frac{16}{3}$ sq. unit (3) $\frac{4}{7}$ sq. unit (4) Cannot be calculated

MAU085

6. The area between the curve $y^2 = 4ax$, x − axis and the ordinates $x = 0$ and $x = a$ is

(1) $\frac{4}{3}\,a^2$ (2) $\frac{8}{3}\,a^2$ (3) $\frac{2}{3}\,a^2$ (4) $\frac{5}{3}\,a^2$

MAU086

7. Area bounded by the curve $y = xe^{x^2}$, x − axis and the ordinates $x = 0, x = a$

(1) $\frac{e^{a^2}+1}{2}$ sq. unit (2) $\frac{e^{a^2}-1}{2}$ sq. unit (3) $e^{a^2} + 1$ sq. unit (4) $e^{a^2} - 1$ sq. unit

MAU087

8. If the ordinate $x = a$ divides the area bounded by the curve $y = \left(1 + \frac{8}{x^2}\right)$, x −axis and the ordinates $x = 2, x = 4$ into two equal parts, then $\boldsymbol{a}$ =

(1) 8 (2) $2\sqrt{2}$ (3) 2 (4) $\sqrt{2}$

MAU088

9. Area bounded by curve $y = x^3$, x − axis and ordinates $x = 1$ and $x = 4$, is

(1) 64 sq. unit (2) 27 sq. unit (3) $\frac{127}{4}$ sq. unit (4) $\frac{255}{4}$ sq. unit

MAU089

10. Area bounded by $y = x \sin x$ and x − axis between $x = 0$ and $x = 2\pi$, is

(1) 0 (2) 2π sq. unit (3) π sq. unit (4) 4π sq. unit

MAU090

11. Area under the curve $y = \sqrt{3x+4}$ between $x = 0$ and $x = 4$, is

(1) $\frac{56}{9}$ sq. unit (2) $\frac{64}{9}$ sq. unit (3) 8 sq. unit (4) None of these

MAU091

12. If the area above the x-axis, bounded by the curves $y = 2^{kx}$ and $x = 0$ and $x = 2$ is $\frac{3}{ln\,2}$, then the value of k is

(1) $\frac{1}{2}$ (2) 1 (3) −1 (4) 2

MAU092

13. The area bounded by the curve $xy = 4$ and the line $x + y = 5$ is

(1) $\frac{15}{2} + \ell n4$ (2) $\frac{15}{2} + \ell n2$ (3) $\frac{15}{2} - 4\ell n4$ (4) $\frac{15}{2} - \ell n2$

MAU093

14. The area bounded by the curve $y^2 = 4x$ and the line $2x - 3y + 4 = 0$ is

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

MAU094

15. The area bounded by the x-axis, the curve $y = f(x)$ and the lines $x = 1, x = b$ is equal to $\sqrt{b^2+1} - \sqrt{2}$ for all $b > 1$, then $f(x)$ is

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

MAU095

16. Let $f(x)$ be a non-negative continuous function such that the area bounded by the curve $y = f(x)$, x-axis and the ordinates $x = \frac{\pi}{4}, x = \beta > \frac{\pi}{4}$ is $\left(\beta\sin\beta + \frac{\pi}{4}\cos\beta + \sqrt{2}\beta\right)$. Then $f\left(\frac{\pi}{2}\right)$ is

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

MAU096

17. Area bounded by the curve $xy - 3x - 2y - 10 = 0$, x − axis and the lines $x = 3, x = 4$ is

(1) $16\,log\,2 - 13$ (2) $16\,log\,2 - 3$ (3) $16\,log\,2 + 3$ (4) None of these

MAU097

18. The surface area of the solid formed by rotating the area enclosed between the curve $y = x^2$ and the line $y = 1$ about $y = 1$ is (in sq. units)

(1) $9\pi/5$ (2) $4\pi/3$ (3) $8\pi/3$ (4) $7\pi/5$

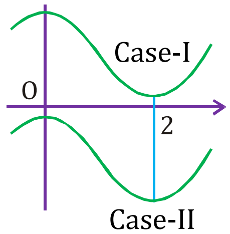
MAU098

19. If A is the area of the region bounded by the curve $y = \sqrt{3x+4}, x$- axis and the line $x = -1$ and $x = 4$ and B is that area bounded by curve $y^2 = 3x + 4, x$-axis and the lines $x = -1$ and $x = 4$ then $A : B$ is equal to

(1) 1 : 1 (2) 2 : 1 (3) 1 : 2 (4) None of these

MAU099

20. If the area bounded by $f(x) = \frac{x^3}{3} - x^2 + a$ and the straight lines $x = 0$; $x = 2$ and the $x -$ axis is minimum then find the value of $'a'$.



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

MAU100

SECTION-B

- This section will have **TEN** questions. Candidate can choose to attempt any 5 question out of these 10 questions. In case if candidate attempts more than 5 questions, first 5 attempted questions will be considered for marking.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value (Answer should be rounded off to the nearest integer).
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+4, if only correct answer is given.
Zero Marks	:	0, if no answer is given.
Negative Marks	:	-1 for incorrect answer

1. Find the value of $m (m > 0)$ for which the area bounded by the line $y = mx + 2$ and $x = 2y - y^2$ is 9/2 square units.

MAU101

2. Find area bounded by $y = f^{-1}(x), x = 10, x = 4$ and $x -$ axis given that area bounded by $y = f(x), x = 2, x = 6$ and x-axis is 30 sq. units, where $f(2) = 4$ and $f(6) = 10$. (given $f(x)$ is an invertible function)

MAU102

3. A farmer $\boldsymbol{F_1}$ has a land in the shape of a triangle with vertices at $P(0, 0), Q(1, 1)$ and $R(2, 0)$. From this land, a neighbouring farmer F_2 takes away the region which lies between the side PQ and a curve of the form $y = x^n$ $(n > 1)$. If the area of the region taken away by the farmer F_2 is exactly 30% of the area of ΔPQR, then the value of n i

MAU103

4. The area bounded by curve $y = e^x, y = 1, y = 3$ and y-axis is $\lambda \ell n 3 + \mu, \lambda, \mu \in I$ then $\lambda + \mu =$

MAU104

5. If the area bounded by parabola $y^2 = x$ and straight line $2y = x$ is k then $3k$ is equal to

MAU105

6. The area enclosed between the curve $y = log_e(x + e)$ and the co-ordinate axes is

MAU106

7. If area bounded by the curves $y^2 = 4ax$ and $y = mx$ is $\frac{a^2}{3}$, then the value of m is

MAU107

8. Area under the curve $y = sin\,2\,x + cos\,2\,x$ between $x = 0$ and $x = \frac{\pi}{4}$, is

MAU108

9. If a curve $y = a\sqrt{x} + bx$ passes through the point $(1, 2)$ and the area bounded by the curve, line $x = 4$ and x −axis is 8 sq. unit, then $a + b$ is

MAU109

10. A frustum of sphere is made by cutting two parallel planes of any sphere. If radius of sphere is 5 cm and distance between the plane is 1 cm and the area of curved surface of frustum when the distance of first plane from the centre of sphere is 2 cm is $k\pi$ then value of k is

MAU110

JEE (Advanced) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION–I

- This section contains **FOUR** questions.
- Each question has FOUR options (A), (B), (C) and (D). ONLY ONE of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

Full Marks	:	+3, if only the bubble corresponding to the correct option is darkened.
Zero Marks	:	0, if none of the bubbles is darkened.
Negative Marks	:	–1, in all other cases

1. Find the area bounded by the y-axis and the curve $x = e^y \sin \pi y$, $y = 0$, $y = 1$.

(A) $\frac{(e+1)\ \pi}{1+\pi^2}$ (B) $\frac{(e-1)\ \pi}{1+\pi^2}$

(C) 0 (D) $\frac{(e-1)\ \pi}{1-\pi^2}$

MAU111

2. Find the area of the region bounded by $y = \{x\}$ and $2x - 1 = 0$, $y = 0$, ({ } stands for fraction part)

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{1}{8}$ (D) $\frac{1}{16}$

MAU112

3. Compute the area of the figure bounded by straight lines $x = 0$, $x = 2$ and the curves $y = 2^x$ and $y = 2x - x^2$

(A) $\left(\frac{3}{\log_e 2}-\frac{1}{3}\right)$ (B) $\left(\frac{3}{\log_e 2}-\frac{4}{3}\right)$

(C) $\left(\frac{3}{\log_e 2}\right)$ (D) $\left(\frac{4}{3}\right)$

MAU113

4. Let $f(x) = \sqrt{\tan x}$. If area bounded by $y = f(x)$, $y = f(c)$, $x = 0$ and $x = a$, $0 < c < a < \frac{\pi}{2}$ is minimum when $c = \frac{a}{k}$ then find k

(A) 1 (B) 2

(C) 3 (D) 4

MAU114

SECTION-II

- This section contains **FOUR** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 if only (all) the correct option(s) is (are) chosen.

Partial Marks : +3 if all the four options are correct but ONLY three options are chosen.

Partial Marks : +2 if three or more options are correct but ONLY two options are chosen, both of which are correct options.

Partial Marks : +1 if two or more options are correct but ONLY one option is chosen and it is a correct option.

Zero Marks : 0 if none of the options is chosen (i.e. the question is unanswered).

Negative Marks : –2 in all other cases.

For Example : If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in –2 marks.

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5. Area bounded by $y = \sin^{-1}x$, $y = \cos^{-1}x$, $y = 0$ in first quadrant is equal to:

(A) $\int_0^{1/\sqrt{2}} (\sin^{-1} x)dx + \int_{1/\sqrt{2}}^{1} (\cos^{-1} x)dx$

(B) $\int_{\pi/4}^{\pi/2} (\sin y - \cos y)dy$

(C) $\int_0^{\pi/4} (\cos y - \sin y)dy$

(D) $(\sqrt{2}-1)$ sq. unit

MAU115

6. Let $f(x)$ be a non-negative, continuous and even function such that area bounded by x-axis, y-axis & $y = f(x)$ is equal to $(x^2 + x^3)$ sq. units $\forall\ x \ge 0$, then

(A) $\sum_{r=1}^{n} f'(r) = 3n^2 + 5n\ \forall\ n \in N$

(B) $\sum_{r=1}^{n} f'(r) = 6n^2 + 5n\ \forall\ n \in N$

(C) $f(x) = 3x^2 + 2x\ \forall\ x \le 0$

(D) $f(x) = 3x^2 - 2x\ \forall\ x \le 0$

MAU116

7. Let 'c' be a positive real number such that area bounded by $y = 0$ $y = [\tan^{-1}x]$ from $x = 0$ to $x = c$ is equal to area bounded by $y = 0$, $y = [\cot^{-1} x]$, from $x = 0$ to $x = c$ (where [*] represents greatest integer function), then

(A) $c = \tan 1 + \cot 1$ (B) $c = 2\text{cosec}2$

(C) $c = \tan 1 - \cot 1$ (D) $c = -2\cot 2$

MAU117

8. Area bounded by $y = x^2 - 2|x|$ and $y = -1$ is equal to

(A) $2\int_0^1 (2x - x^2)dx$

(B) $\frac{2}{3}$ sq. units

(C) $\frac{2}{3}$ (Area of rectangle $ABCD$) where points A, B, C, D are (–1, –1), (–1, 0), (1, 0) & (1, –1)

(D) $\frac{1}{3}$ (Area of rectangle $ABCD$) where points A, B, C, D are (–1, –1), (–1, 0), (1, 0) & (1, –1)

MAU118

SECTION–III

- This section contains **ONE** paragraph.
- Based on each paragraph, there are **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D) **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +3 if only the bubble corresponding to the correct answer is darkened.

Zero Marks : 0 in all other cases.

Comprehension # 1 (Q. No. 9 - 10)

Let $C_1 : x^2 \le 4\,[\sqrt{x}]\,y$, when $1 \le x < 8$ and $1 \le y < 8$; $x^2 \ge 4\,[\sqrt{x}]\,y$, when $8 \le x < 9$ and $8 \le y < 9$

$C_2 : y^2 \le 4\,[\sqrt{x}]\,x$, when $1 \le x < 8$ and $1 \le y < 8$; $y^2 \ge 4\,[\sqrt{x}]\,x$, when $8 \le x < 9$ and $8 \le y < 9$

and $C_3 : x^2 + y^2 \ge 5\,[\sqrt{x}]\,.\,[\sqrt{y}]$, when $1 \le x < 4$, $1 \le y < 4$

be three curves, where [.] denotes greatest integer function.

9. The area of the region bounded by the curves C_1 and C_2, when $1 \le x < 4$ and $1 \le y < 4$, is

(A) $\frac{11}{3}$ (B) 9 (C) $\frac{9}{4}$ (D) $\frac{1}{4}$

MAU119

10. Total area of the region between the curves C_1 and C_2, when $4 \le x < 9$ and $4 \le y < 9$, is

(A) $65 + \frac{280\sqrt{2}}{3}$ (B) $113 + 72\sqrt{2}$ (C) $65 - \frac{280\sqrt{2}}{3}$ (D) $113 - 72\sqrt{2}$

MAU120

SECTION-IV

- This section contains **EIGHT** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 **ONLY** if the correct numerical value is entered;

Zero Marks : 0 In all other cases.

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11. Find the value of $m(m > 0)$ for which the area bounded by the line $y = mx + 2$ and $x = 2y - y^2$ is $9/2$ square units.

MAU121

12. Find area bounded by $y = f^{-1}(x)$, $x = 10$, $x = 4$ and x-axis given that area bounded by $y = f(x)$, $x = 2$, $x = 6$ and x-axis is 30 sq. units, where $f(2) = 4$ and $f(6) = 10$. (given $f(x)$ is an invertible function)

MAU122

13. Consider a line $\ell : 2x - \sqrt{3}\,y = 0$ and a parameterized $C : x = \tan t, y = \frac{1}{\cos t}\left(0 \le t < \frac{\pi}{2}\right)$

If the area of the part bounded by ℓ, C and the y-axis is equal to $\frac{1}{4}\ell n(a+\sqrt{b})$, where $a, b, \in N$, b, is not perfect square then find the value of $(a + b)$

MAU123

14. Find the area enclosed between the curve $y = x^3 + 3$, $y = 0$, $x = -1$, $x = 2$.

MAU124

15. If the area bounded by the curve $y = 2x^4 - x^2$, x-axis and the two ordinates corresponding to the minima of the function is $120A$

MAU125

16. Find the area of the region bounded by the curve $y^3 = 2y - x$ and the y-axis.

MAU126

17. Find the area included between the parabolas $y^2 = x$ and $x = 3 - 2y^2$.

MAU127

18. A tangent is drawn to the curve $x^2 + 2x - 4ky + 3 = 0$ at a point whose abscissa is 3. This tangent is perpendicular to $x + 3 = 2y$. Find the area bounded by the curve, this tangent and ordinate $x = -1$

MAU128

ANSWER KEY

EXERCISE - O

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	C	D	D	A	A	B	A	D	A
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	A,C,D	B,C,D	B,C	B,C	A,B	A,B	A,D	A,B	A,C	A,B,C,D
Que.	21	22	23	24	25					
Ans.	A,C,D	A	B	D	B					

EXERCISE - S

1. 2 **2.** 18 **3.** 24 **4.** 2 **5.** 104

6. 4 **7.** $\frac{4\pi}{3} - \sqrt{3}$ **8.** 1 **9.** 0.67 **10.** 2

EXERCISE - JEE (Main) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	1	3	4	2	2	64	1	19	4	62
Que.	11	12	13	14	15	16	17	18		
Ans.	2	36	3	2	600	4	1	4		

EXERCISE - JEE (Advanced) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	B	3	A,D	B,C	4	B	A	A	6	B,C,D
Que.	11									
Ans.	8									

JEE (Main) Practice Paper

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	4	3	3	2	1	2	2	2	4	4
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	4	2	3	1	4	2	3	2	1	3
Section-B	Q.	1	2	3	4	5	6	7	8	9	10
	A.	1	22	4	1	4	1	2	1	2	10

JEE (Advanced) Practice Paper

Section-I	Q.	1	2	3	4				
	A.	A	C	B	B				
Section-II	Q.	5	6	7	8				
	A.	A,B,C,D	A,D	A,B	B,D				
Section-III	Q.	9	10						
	A.	A	C						
Section-IV	Q.	11	12	13	14	15	16	17	18
	A.	1	22	55	12.75	7	1.33	4	5.33

Important Notes

Important Notes