MATHS

BOOKS - ARIHANT MATHS

AREA OF BOUNDED REGIONS

Examples

1. Mark the region represtented by $3x + 4y \leq 12$.

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2. Sketch the curve $y = x^3$.

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3. Sketch the curve $y = x^3 - 4x$.

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4. Sketch the curve $y = (x - 1)(x - 2)(x - 3)$.

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5. Sketch the graph for $y = \cos^{-1} x, \forall x \in [-1, 1]$.

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6. Defiine $y = \sin^{-1}(3x - 4x^3)$ in terms of $\sin^{-1}$ x and also draw its graph.

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7. Define $y = \sin^{-1}(3x - 4x^3)$ in terms of $\sin^{-1}$ x and also draw its graph.

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8. Draw the graph for $y = (\{x\} - 1)^2$.

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9. Draw the graph for $|y| = (x - 1)(x - 2)$.

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10. Draw the graph for $y = (\{x\} - 1)^2$.

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11. Sketch the graph y = |x + 1|. Evaluate $\int_{-4}^{2} |x + 1| dx$.

What does the value of this integral represent on the graph ?

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12. Find the area of the smaller region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the line $\frac{x}{a} + \frac{y}{b} = 1$

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13. Area lying in the first quadrant and bounded by the circle $x^2 + y^2 = 4$ and the lines $x = 0$ and $x = 2$ is :

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14. The focus of the parabola $y = 2x^2 + x$ is

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15. The area enclosed by $y = x(x-1)(x-2)$ and x-axis, is given by

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16. The area between the curve $y = 2x^4 - x^2$, the axis, and the ordinates of the two minima of the curve is

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17. Sketch the curves and identify the region bounded by the curves $x = \frac{1}{2}, x = 2, y = \log x a n y = 2^x \cdot$ Find the area of this region.

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18. Find the area of region bounded by curve $x^2 = y$ and $y = 4$.

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19. Draw the rough sketch and find the area of the region : $\{(x, y) : 4x^2 + y^2 \leq 4, 2x + y \geq 2\}$.

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20. find the area of the region bounded by 'y^2=4x' and x=2

A. π sq units

B. $(2\pi - 1)$sq units

C. $\left(\frac{\pi}{4} - \frac{1}{6}\right)$sq units

D. None of these

Answer: C

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21. Find the area enclosed by the circle $x^2 + y^2$ =1.

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22. Let $e^{f(x)} = \log x$ If $g(x)$ is the inverse of $f(x)$, then find $g'(x)$.

A. $\frac{5}{3}$ sq units

B. 5 sq units

C. $\frac{10}{3}$ sq units

D. None of these

Answer: C

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23. Find the area of the region bounded by the curves $y = x^2, y = |2 - x^2|, \text{ and } y = 2,$ which lies to the right of the line x=1.

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24. The area enclosed by the curve $|y| = \sin 2x,$ where $x \in [0, 2\pi].$ is

A. 1 sq unit

B. 2 sq unit

C. 3 sq unit

D. 4 sq unit

Answer: D

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25. If α and $\beta(\alpha < \beta)$ are the roots of the equation $x^2 + bx + c = 0$ where $c < 0 < b$, then

A. $\frac{1}{2}(\pi - 3)$ sq units

B. $\frac{\pi}{3}$ sq units

C. $\frac{\pi}{4}$ sq units

D. None of these

Answer: D

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26. Find the area bounded by curves $\{(x, y) : y \geq x^2$ and $y = |x|\}$

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27. If $f(x + y) = f(x).\ f(y)$ for all x and y. $f(1) = 2$, then area enclosed by $3|x| + 2|y| \leq 8$ is

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28. Let $f(x) = \max\left\{\sin x, \cos x, \frac{1}{2}\right\}$, then determine the area of region bounded by the curves $y = f(x)$, X-axis, Y-axis and $x = 2\pi$.

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29. If A denotes the area bounded by $f(x) = \left|\frac{\sin x + \cos x}{x}\right|$, X-axis, $x = \pi$ and $x = 3\pi$,then

a. $1 < A < 2$

b. $0 < A < 2$

c. $2 < A < 3$

d. None of these

A. $1 < A < 2$

B. $0 < A < 2$

C. $2 < A < 3$

D. None of these

Answer: B

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30. If $y = f(x)$ makes positive intercepts of 2 and 1 unit on x and y-coordinates axes and encloses an area of $\frac{3}{4}$ sq unit with the axes, then

$\int_0^2 x f'(x)\, dx$, is

A. $\frac{3}{4}$

B. 1

C. $\frac{5}{4}$

D. $-\frac{3}{4}$

Answer: D

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31. The area of the region included between the regions satisfying $\min(|x|, |y|) \geq 1$ and $x^2 + y^2 \leq 5$ is

A. $\frac{5}{2}\left(\frac{\sin^{-1}(2)}{\sqrt{5}} - \frac{\sin^{-1} 1}{\sqrt{5}}\right) - 4$

B. $10\left(\frac{\sin^{-1}(2)}{\sqrt{5}} - \frac{\sin^{-1}(1)}{\sqrt{5}}\right) - 4$

C. $\frac{2}{5}\left(\frac{\sin^{-1}(2)}{\sqrt{5}} - \frac{\sin^{-1}(1)}{\sqrt{5}}\right) - 4$

D. $15\left(\frac{\sin^{-1}(2)}{\sqrt{5}} - \frac{\sin^{-1}(1)}{\sqrt{5}}\right) - 4$

Answer: B

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32. The area of the region bounded by the curves $y = \sqrt{\frac{1+\sin x}{\cos x}}$ and $y = \sqrt{\frac{1-\sin x}{\cos x}}$ bounded by the lines x=0 and $x = \frac{\pi}{4}$ is

A. $\int_0^{\sqrt{2}-1} \frac{t}{(1+t^2)\sqrt{1-t^2}} dt$

B. $\int_0^{\sqrt{2}-1} \frac{4t}{(1+t^2)\sqrt{1-t^2}} dt$

C. $\int_0^{\sqrt{2}=1} \frac{4t}{(1+t^2)\sqrt{1-t^2}} dt$

D. $\int_0^{\sqrt{2}+1} \frac{t}{(1+t^2)\sqrt{1-t^2}} dt$

Answer: B

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33. The vertices of a triangle are A(0, 0), B(0, 2) and C(2, 0). The distance between circumcentre and orthocentre is

A. Area $(R)=\frac{c^3}{6}$

B. Area of $R=\frac{c^3}{3}$

C. $\lim_{c\to 0^+}\frac{Area(T)}{Area(R)}=3$

D. $\lim_{c\to 0^+}\frac{Area(T)}{Area(R)}=\frac{3}{2}$

Answer: A::C

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34. Suppose fis 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 decreases 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

Answer: A::C::D

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35. Consider $f(x) = \begin{cases} \cos x & 0 \le x < \frac{\pi}{2} \\ \left(\frac{\pi}{2} - x\right)^2 & \frac{\pi}{2} \le x < \pi \end{cases}$ such that f is periodic with period π. Then which of the following is not true?

A. the range of f is $\left[0, \frac{\pi^2}{4}\right)$

B. f is discontinuous for x

C. f is continuous fo all real x

D. the area bounded by $y = f(x)$ and the X-axis for $x = n\pi$ to $x = n\pi$ is n(1+(pi^3)/(24))f or $agiven$n in N`

Answer: A::D

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36. consider the function $f(x) = \frac{x^2}{x^2 - 1}$

If f is defined from $R - (-1, 1) \rightarrow R$ then f is

A. 12

B. 15

C. 20

D. 30

Answer: B::C::D

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37. The area bounded by the axes of reference and the normal to $y = \log_e x$ at (1,0), is

A. $e - 1$

B. $\int_1^e In(e + 1 - y)dy$

C. $e - \int_0^1 e^x dx$

D. $\int_0^e Inydy$

Answer: B::C::D

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38. Find the range of the following function:- $f(x) = x^2 + 2$, x is a real number.

A. 1

B. 2

C. 3

D. 4

Answer: C

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39. Consider the function $f(x) = |x^3 + 1|$. Then,

A. (a)is one-one onto

B. (b)is many-one onto

C. (c)has 3 real roots

D. (d)is such that $f(x_1) \cdot f(x_2) < 0$ where x_1 and x_2 are the roots of

$f'(x) = 0$

Answer: B

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40. Consider the function $f(x) = |x^3 + 1|$. Then,

A. $65/12$

B. $13/12$

C. $71/12$

D. None of these

Answer: A

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41. If $f(x+y)=f(x).\,f(y)$ for all x and $y.\,f(1)=2,$ then area enclosed by $3|x|+2|y|\leq 8$ is

A. $\sum_{r=0}^{n}\int_{x_r}^{x_{r+1}}(-1)^r h(x)dx$

B. $\sum_{r=0}^{n}\int_{x_r}^{x_{r+1}}(-1)^{r+1} h(x)dx$

C. $2\sum_{r=0}^{n}\int_{x_r}^{x_{r+1}}(-1)^r h(x)dx$

D. $\frac{1}{2}\sum_{r=0}^{n}\int_{x_r}^{x_{r+1}}(-1)^{r+1} h(x)dx$

Answer: A

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42. Let $h(x)=f(x)-g(x)$, where $f(x)=\sin^4\pi x$ and $g(x)=\log x$. Let $x_0, x_1, x_2, \ldots, x_{n+1}$ be the roots of $f(x)=g(x)$ in increasing order.

In the above question, the value of n is

A. 1

B. 2

C. 3

D. 4

Answer: B

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43. Find the area enclosed by $y = x(x-1)(x-2)$ and X-axis`.

A. $\frac{11}{8}$

B. $\frac{8}{3}$

C. 2

D. $\frac{13}{3}$

Answer: A

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44. Let f be differentiable function satisfying $f\left(\frac{x}{y}\right) = f(x) - f(y) \text{for all} x, y > 0$. If f'(1) = 1, then f(x) is

A. $\frac{4\sqrt{2}}{7^3 3^2}$

B. $-\frac{4\sqrt{2}}{7^3 3^2}$

C. $\frac{4\sqrt{2}}{7^3 3}$

D. $-\frac{4\sqrt{2}}{7^3 3}$

Answer: B

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45. Find the area of the region bounded by the curve $y^2 = 4x$ and the line $x = 3$.

A. $\int_a^b \frac{x}{3\left[\{f(x)\}^2 - 1\right]} dx + by(b) - af(a)$

B. $-\int_a^b \frac{x}{3\left[\{f(x)\}^2-1\right]}dx - by(b) + af(a)$

C. $\int_a^b \frac{x}{3\left[\{f(x)\}^2-1\right]}dx - by(b) + af(a)$

D. $-\int_a^b \frac{x}{3\left[\{f(x)\}^2-1\right]}dx + by(b) = af(a)$

Answer: A

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46. Let f be differentiable function satisfying $f\left(\frac{x}{y}\right) = f(x) - f(y) \text{for all} x, y > 0$. If f'(1) = 1, then f(x) is

A. $2g(-1)$

B. 0

C. $-2g(1)$

D. $2g(1)$

Answer: D

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47. Find the area bounded by the curve $y = \sin x$ between x=0 and $x = 2i$

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48. The x-intercept of the tangent to a curve is equal to the ordinate of the point of contact. The equation of the curve through the point $(1, 1)$ is

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49. Sketch the region bounded by the curves $y = x^2$ and $y = \frac{2}{1 + x^2}$. Find the area.

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50. Find the area enclosed by the curves

$\max (|x + y|, |x - y|) = 1$

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51. Find the area of the region bounded by the curve $y^2 = 4x$ and the line $x = 3$.

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52. Find the area of the region enclosed between the parabolas $x^2 = 4y$ and $y^2 = 4x$. Also draw its rough sketch.

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53. Derive the relationship between C_p and C_v.

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54. Find the area of the region bounded by the curve $y = x^2 + 2, y = x, x = 0$ and $x = 3$

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55. Find the area bounded between the curve $y^2 = 4x$ and the lines x=3

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56. Consider a square with vertices at $(1, 1), (-1, 1), (-1, -1), and (1, -1)$. Set S be the region consisting of all points inside the square which are nearer to the origin than to any edge. find its area.

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57. Find the area of the region bounded by the curve $y = x^2 + 2, y = x, x = 0$ and $x = 3$

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58. Find the area included between the curves $y^2 = 4ax$ and $x^2 = 4ay, a > 0.$

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59. Find the area of smaller region founded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the straight line $\frac{x}{3} + \frac{y}{2} = 1$

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60. The largest area of a rectangle which has one side on the x-axis and the two vertices on the curve $y = e^{-x^2}$ is

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61. Find the area of the region bounded by the curve $y=2\sqrt{1-x^2}$ and x-axis.

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62. Prove that the point $\left\{\frac{a}{2}\left(t+\frac{1}{t}\right), \frac{b}{2}\left(t-\frac{1}{t}\right)\right\}$ lies on the hyperbola for all values of $t(t \neq 0)$.

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63. Find the area enclosed by the circle $x^2+y^2=r^2$

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64. Find the area of the region bounded by the curves $y = x^2, y = x, x = 0$ and $x = 3$.

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65. $f(x) = \frac{1}{\sqrt{[x]^2 - [x] - 6}}$, where $[\cdot]$ denotes the greatest integer function.

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66. Area bounded by the curve $y = x^3$, the x-axis and the ordinates $x = -2, x = 1$ is:

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67. Let O(0, 0) and $B\left(1, \frac{1}{\sqrt{3}}\right)$ be the vertices of a triangle. Let R be the region consisting of all those points P inside ΔOAB satisfying. $d(P, OA)lr$ min $\{d(P, OB), d(P, AB)\}$, where d denotes the distance from the point P to the corresponding line. Let M be peak of region R.

The perimeter of region R is equal to

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68. Let O(0, 0) and $B\left(1, \frac{1}{\sqrt{3}}\right)$ be the vertices of a triangle. Let R be the region consisting of all those points P inside ΔOAB satisfying. $d(P, OA)lr$ min $\{d(P, OB), d(P, AB)\}$, where d denotes the distance from the point P to the corresponding line. Let M be peak of region R.

The perimeter of region R is equal to

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69. A curve y= f(x) passes through the origin. Through any point (x,y) on the lines are drawn paralled to the coordinate axes. If the curve divides the area formed by these lines and coordinate axes in the ratio m:n. Then the equation of curve is

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70. the value of $\int_0^{[x]} dx$ (where , [.] denotes the greatest integer function)

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71. Area bounded by the curve $y = x^3$, the x-axis and the ordinates $x = -2, x = 1$ is:

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72. If the area bounded by the curve y=f(x), x-axis and the ordinates x=1 and x=b is (b-1) $\sin(3b+4)$, then find f(x).

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73. Find the area enclosed by the curves

$\max\ (2|x|, 2|y|) = 1$

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74. Find the area of the region bounded by the curves $y = x^2, y = x, x = 0$ and $x = 3$.

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75. Find the area of the region which is inside the parabola satisfying the condition $|x - 2y| + |x + 2y| \leq 8$ and $xy \geq 2$.

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76. Consider the function $f(x) = \begin{cases} x = [x] - \frac{1}{2}, & \text{if } x \in I \\ 0, & \text{if } x \in I \end{cases}$ Where $[.]$ denotes greatest integer function and I is the set of integers, then $g(x) = \max\{x^2, f(x), |x|\}, -2 \leq x \leq 2$ is defined as

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77. Write the discriminant of the following quadratic equation :

$x^2 + px + 2q = 0$

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78. Find the area of the region bounded by the curves $y = x^2$ and $y = \sec^{-1}\left[-\sin^2 x\right]$, where [.] denotes G.I.F.

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79. Draw a graph of the function $f(x) = \cos^{-1}(4x^3 - 3x), x \in [-1, 1]$ and find the ara enclosed between the graph of the function and the x-axis varies from 0 to 1.

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80. The set of values of θ such that tan 2 θ = 1

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81. Let $f(x)$ be continuous function given by $f(x) = \begin{cases} 2x & |x| \leq 1 \\ x^2 + ax + b & |x| > 1 \end{cases}$

Find the area of the region in the third quadrant bounded by the curves $x = -2y^2 and y = f(x)$ lying on the left of the line $8x + 1 = 0$.

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82. Let $[x]$ denotes the greatest integer function. Draw a rough sketch of the portions of the curves $x^2 = 4[\sqrt{x}]y$ and $y^2 = 4[\sqrt{y}]x$ that lie within the square $\{(x, y) \mid 1 \leq x \leq 4, 1 \leq y \leq 4\}$. Find the area of the part of the square that is enclosed by the two curves and the line $x + y = 3$.

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83. Find all the values of the parameter $a (a \leq 1)$ for which the area of the figure bounded by pair of straight lines $y^2 - 3y + 2 = 0$ and curves $y = [a]x^2, y = \frac{1}{2}[a]x^2$ is greatest , where [.] denotes the greatest integer function.

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84. Find the area in the 1^{st}quadrant bounded by $[x] + [y] = n$, where $n \in N$ and $y = k$(where $k \in n \forall k \leq n + 1$), where [.] denotes the greatest integer less than or equal to x.

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Exercise For Session 1

1. Draw a rough sketch of $y = \sin 2x$ and determine the area enclosed by the curve. X-axis and the lines $x = \pi/4$ and $x = 3\pi/4$.

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2. Find the area under the curve $y = (x^2 + 2)^2 + 2x$ between the ordinates x =0 and x=2`

A. $\frac{236}{15}$ sq units

B. $\frac{136}{14}$ sq units

C. $\frac{432}{15}$ sq units

D. $\frac{436}{14}$ sq units

Answer: $\frac{436}{14}$ **sq units**

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

A. $\frac{1}{3}$ sq units

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

C. $\frac{4}{3}$ sq units

D. $\frac{5}{3}$ sq units

Answer: $\frac{4}{3}$ **sq units**

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

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5. Find the area bounded by the curve $y = 4 - x^2$ and the lines $y = 0,\ y = 3.$

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6. Find the area of the region bounded by the curve $x = at^2, y = 2at$ between the ordinates corresponding $t = 1andt = 2.$

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7. Find the area of region bounded by

The parabola $y^2 = 4ax$ and its latus rectum

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8. Find the area bounded by $y = 1 + 2\sin^2 x$, X-axis, $X = 0$ and $x = \pi$.

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9. Sketch the graph of $y = \sqrt{x}$ and determine the area of the region enclosed by the curve, the axis of X and the lines $x = 0, x = 4$.

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10. Find the area of the region bounded by the curve $xy - 3x - 2y - 10 = 0$, x-axis and the lines $x = 3, \ x = 4$.

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Exercise For Session 2

1. Find the area of the region bounded by parabola $y^2 = 2x + 1$ and the line $x - y - 1 = 0$.

A. $2/3$

B. $4/3$

C. $8/3$

D. $16/3$

Answer: D

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2. Find the area bounded by the curve $y = 2x - x^2$, and the line $y = -x$

A. $9/2$

B. $43/6$

C. $35/6$

D. None of these

Answer: A

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3. The area bounded by the curve $y = x|x|$,x-axis and the ordinates $x = -1, x = 1$ is given by:

A. 0

B. $1/3$

C. $2/3$

D. None of these

Answer: C

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4. Area of the region bounded by the curves $y=2^{x}, y=2x-x^{2}, x=0$ and $x=2$ is given by :

A. $\frac{3}{\log 2}-\frac{4}{3}$

B. $\frac{3}{\log 2}+\frac{4}{3}$

C. $3\log 2-\frac{4}{3}$

D. None of these

Answer: A

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5. Find the area (in sq. unit) bounded by the curves : $y=e^{x}, y=e^{-x}$ and the straight line x =1.

A. (a) $e+\frac{1}{e}$

B. (b) $e-\frac{1}{e}$

C. (c) $e+\left(\frac{1}{e}\right)-2$

D. (d) None of these

Answer: A

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6. Area of the region bounded by the curve $y^2 = 4x$, y-axis and the line $y = 3$ is

A. (a) 2

B. (b) $\frac{9}{4}$

C. (c) $6\sqrt{3}$

D. (d) None of these

Answer: B

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7. The area of the region bounded by $y = \sin x$, $y = \cos x$ in the first quadrant is

A. $2(\sqrt{2-1})$

B. $\sqrt{3}+1$

C. $2(\sqrt{3}-1)$

D. None of these

Answer: A

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8. The area bounded by the curves $y = xe^{x}$, $y = xe^{-x}$ and the line x=1 is

A. $\frac{2}{e}$

B. $1-\frac{2}{e}$

C. $\frac{1}{e}$

D. $1-\frac{1}{e}$

Answer: A

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9. The figure into which the curve $y^2 = 6x$ divides the circle $x^2 + y^2 = 16$ are in the ratio

A. $\frac{2}{3}$

B. $\frac{4\pi - \sqrt{3}}{8\pi + \sqrt{3}}$

C. $\frac{4\pi + \sqrt{3}}{8\pi - \sqrt{3}}$

D. None of these

Answer: C

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10. Find the area bounded by the y-axis, $y = \cos x$,and $y = \sin x$ when $0 \leq x \leq \frac{\pi}{2}$.

A. $2\left(\sqrt{2-1}\right)$

B. $\sqrt{2}-1)$

C. $\left(\sqrt{2}+1\right)$

D. $\sqrt{2}$

Answer: B

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11. The area bounded by the curve $y=\dfrac{3}{|x|}$ and $y+|2-x|=2$ is

A. $\dfrac{4-\log 27}{3}$

B. $2-\log^{3}$

C. $2+\log^{3}$

D. None of these

Answer: D

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12. The area bounded by the curves $y = -x^2 + 2$ and $y = 2|x| - x$ is

A. $2/3$

B. $8/3$

C. $4/3$

D. None of these

Answer: D

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13. The are bounded by the curve $y^2 = 4x$ and the circle $x^2 + y^2 - 2x - 3 = 0$ is

A. $2\pi + \frac{8}{3}$

B. $4\pi + \frac{8}{3}$

C. $\pi + \frac{8}{3}$

D. $\pi - \frac{8}{3}$

Answer: A

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14. A point P moves inside a triangle formed by $A(0, 0), B(1, \sqrt{3}), C(2, 0)$ such that min $\{PA, PB, PC) = 1$, then the area bounded by the curve traced by P, is

A. (a)$3\sqrt{3} - \frac{3\pi}{2}$

B. (b)$\sqrt{3} + \frac{\pi}{2}$

C. (c)$\sqrt{3} - \frac{\pi}{2}$

D. (d)$3\sqrt{3} + \frac{3\pi}{2}$

Answer: C

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15. The graph of $y^2 + 2xy + 40|x| = 400$ divides the plane into regions. Then the area of the bounded region is $200 sq units$ (b) $400 sq units$ $800 sq units$ (d) $500 sq units$

A. 400

B. 800

C. 600

D. None of these

Answer: B

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16. The area of the region defined by $||x| - |y|| \geq 1$ and $x^2 + y^2 \leq 1$ in the xy plane is

A. $\pi - 2$

B. $2\pi - 1$

C. 3π

D. 1

Answer: A

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17. The area of the region defined by $1 \leq |x-2| + |y+1| \leq 2$ is

A. 2

B. 4

C. 6

D. None of these

Answer: C

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18. The area of the region enclosed by the curve $|y| = -(1-|x|)^2 + 5$, is

A. $\frac{8}{3}(7+5\sqrt{5})$ sq units

B. $\frac{2}{3}(7+5\sqrt{5})$ sq units

C. $\frac{2}{3}(5\sqrt{5}-7)$ sq units

D. None of these

Answer: A

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19. Write the discriminant of the following quadratic equation :

$x^2 + 4x + 3 = 0$

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20. If $f(x) = \max\left\{\sin x, \cos x, \frac{1}{2}\right\}$, then the area of the region bounded by the curves $y = f(x)$, x-axis, Y-axis and $x = \frac{5\pi}{3}$ is

A. $\left(\sqrt{2} - \sqrt{3} + \frac{5\pi}{12}\right)$sq units

B. $\left(\sqrt{2} + \sqrt{3} + \frac{5\pi}{2}\right)$sq units

C. $\left(\sqrt{2} + \frac{\sqrt{3}}{2} + \frac{5\pi}{2}\right)$sq units

D. None of these

Answer: B

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Exercise Single Option Correct Type Questions

1. A point $P(x, y)$ moves such that $[x + y + 1] = [x]$. Where [.] denotes greatest intetger function and $x \in (0, 2)$, then the area represented by all the possible position of P , is

A. (a)$\sqrt{2}$

B. (b)$2\sqrt{2}$

C. (c)$4\sqrt{2}$

D. (d)2

Answer: D

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2. If $f:[-1,1] \rightarrow \left[-\frac{1}{2}, \frac{1}{2}\right]: f(x) = \frac{x}{1+x^2}$, then find the area bounded by $y = f^{-1}(x)$, the x-axis and the lines $x = \frac{1}{2}, x = -\frac{1}{2}$.

a. $\frac{1}{2}\log e$ b. $\log\left(\frac{e}{2}\right)$

c. $\frac{1}{2}\frac{\log e}{3}$ d. $\frac{1}{2}\log\left(\frac{e}{2}\right)$

A. $\frac{1}{2}\log e$

B. $\log\left(\frac{e}{2}\right)$

C. $\frac{1}{2}\frac{\log e}{3}$

D. $\frac{1}{2}\log\left(\frac{e}{2}\right)$

Answer: B

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3. If the length of latusrectum of ellipse $E_1 : 4(x+y+1)^2 + 2(x-y+3)^2 = 8$ and $E_2 = \frac{x^2}{p} + \frac{y^2}{p^2} = 1, (0 < p < 1)$ are equal , then area of ellipse E_2, is

A. $\frac{\pi}{2}$

B. $\frac{\pi}{\sqrt{2}}$

C. $\frac{\pi}{2\sqrt{2}}$

D. None of these

Answer: B

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4. The area of bounded by the curve $4|x - 2017^{2017}| + 5|y - 2017^{2017}| \leq 20$, is

A. (a)60

B. (b)50

C. (c)40

D. (d)30

Answer: C

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5. If the area bounded by the corve $y = x^2 + 1$, $y = x$ and the pair of lines $x^2 + y^2 + 2xy - 4x - 4y + 3 = 0$ is K units, then the area of the region bounded by the curve $y = x^2 + 1$, $y = \sqrt{x - 1}$ and the pair of lines $(x + y - 1)(x + y - 3) = 0$ is

A. (a)K

B. (b)2K

C. (c) $\frac{K}{2}$

D. (d)None of these

Answer: B

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6. Suppose $y = f(x)$ and $y = g(x)$ are two functions whose graphs intersect at the three point (0, 4), (2,2) and (4, 0) with f(x) gt g(x) for 0 lt x lt 2 and f(x) lt g(x) for 2 lt x lt 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

A. 5

B. 10

C. 15

D. 20

Answer: C

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7. 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. $\frac{1}{2}$

C. 0

D. $\frac{1}{4}$

Answer: D

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8. 3 point O$(0, 0), P(a, a^2), Q(-b, b^2)(a > 0, b > 0)$ are on the parabola $y = x^2$. Let S_1 be the area bounded by the line PQ and parabola let S_2 be the area of the ΔOPQ, the minimum value of S_1 / S_2 is

A. (a)$2 / 3$

B. (b)$5 / 3$

C. (c)2

D. (d)73

Answer: A

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9. Area enclosed by the graph of the function $y = In^2 x - 1$ lying in the 4^{th} `quadrant is

A. $\frac{2}{e}$

B. $\frac{4}{e}$

C. $2\left(e+\frac{1}{e}\right)$

D. $4\left(e-\frac{1}{e}\right)$

Answer: B

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10. The area bounded by $y=2-|2-x|$ and $y=\frac{3}{|x|}$ is:

A. (a) $\frac{4+3\ln 3}{2}$

B. (b) $\frac{19}{8}-3\ln 2$

C. (c) $\frac{3}{2}+\ln 3$

D. (c) $\frac{1}{2}+\ln 3$

Answer: B

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11. Suppose $g(x) = 2x + 1$ and $h(x) = 4x^2 + 4x + 5$ and $h(x) = (fog)(x)$. The area enclosed by the graph of the function $y = f(x)$ and the pair of tangents drawn to it from the origin is:

A. (a) $\frac{8}{3}$

B. (b) $\frac{16}{3}$

C. (c) $\frac{32}{3}$

D. (d) None of these

Answer: B

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12. The area bounded by the curves $y = -\sqrt{-x}$ and $x = -\sqrt{-y}$ where $x, y \le 0$

A. cannot be determined

B. is $\frac{1}{3}$

C. is $\frac{2}{3}$

D. is same as that of the figure bounded by the curves

$y=\sqrt{-x}, x \le 0 \text{ and } x=\sqrt{-y}, y \le 0$

Answer: B

Watch Video Solution

13. $y=f(x)$ is a function which satisfies $f(0)=0$, $f''(x)=f'(x)$ and $f'(0)=1$ then the area bounded by the graph of $y=f(x)$, the lines $x=0$, $x-1=0$ and $y+1=0$ is

A. e

B. e-2

C. e-1

D. e+1

Answer: C

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14. The area of the region enclosed between the curves $x = y^2 - 1$ and $x = |x|\sqrt{1 - y^2}$ is

A. 1

B. $4/3$

C. $2/3$

D. 2

Answer: D

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15. The area bounded by the curve $y = xe^{-x}$, $y = 0$ and $x = c$, where c is the x-coordinate to the curve's inflection point, is

A. $1 - 3e^{-2}$

B. $1 - 2e^{-2}$

C. $1 - e^{-2}$

D. 1

Answer: A

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16. If $(a, 0)$, agt 0, is the point where the curve $y = \sin 2x - \sqrt{3} \sin x$ cuts the x-axis first, A is the area bounded by this part of the curve, the origin and the positive x-axis. Then

A. $4A + 8 \cos a = 7$

B. $4A + 8 \sin a = 7$

C. $4A - 8 \sin a = 7$

D. $4A - 8 \cos a = 7$

Answer: A

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17. 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. $\frac{1}{6}$

Answer: A

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18. 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 is

A. (a) $\sqrt{2}-1$

B. (b) $\sqrt{2}$

C. (c) 1

D. (d) $\frac{1}{\sqrt{2}}$

Answer: A

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19. If the area bounded between X-axis and the graph of $y=6x-3x^2$ between the ordinates $x=1$ and x=a` is 10sq units, then 'a' can take the value

A. (a)4 or -2

B. (b)two values are in (2,3) and one in (-1,0)

C. (c)two values are in (3,4) and one in (-2,-1)

D. (d)None of the above

Answer: C

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20. Area bounded by $y = f^{-1}(x)$ and tangent and normal drawn to it at points with abscissae π and 2π, where $f(x) = \sin x - x$ is

A. a) $\frac{\pi^2}{2} - 1$

B. b) $\frac{\pi^2}{2} - 2$

C. c) $\frac{\pi^2}{2} - 4$

D. d) $\frac{\pi^2}{2}$

Answer: B

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21. If $f(x) = x - 1$ and $g(x) = |f|(x)| - 2|$, then the area bounded by $y = g(x)$ and the curve $x^2 - 4y + 8 = 0$ is equal to

A. $\frac{4}{3}(4\sqrt{2}-5)$

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

C. $\frac{8}{3}(4\sqrt{2}-3)$

D. $\frac{8}{3}(4\sqrt{2}-5)$

Answer: A

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22. Let

$S=\left\{(x,y):\frac{y(3x-1)}{x(3x-2)}<0\right\}, S'=\{(x,y)\in A\times B: -1\leq A\leq 1, -$

then the area of the region enclosed by all points in $S\cap S'$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

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23. The area of the region bounded between the curves $y = e||x|In|x\ |\ \ |$, $x^2 + y^2 - 2(|x| + |y|) + 1 \geq 0$ and X-axis where $|x| \leq 1$, if α is the x-coordinate of the point of intersection of curves in 1st quadrant, is

A. $4\left[\int_0^\alpha exInxdx + \int_\alpha^1 \left(1 - \sqrt{1 - (x-1)^2}\right)dx\right]$

B. $4\left[\int_0^\alpha exInxdx + \int_1^\alpha \left(1 - \sqrt{1 - (x-1)^2}\right)dx\right]$

C. $4\left[-\int_0^\alpha exInxdx + \int_\alpha^1 \left(1 - \sqrt{1 - (x-1)^2}\right)dx\right]$

D. $2\left[\int_0^\alpha exInxdx + \int_\alpha^1 \left(1 - \sqrt{1 - (x-1)^2}\right)dx\right]$

Answer: D

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24. A point P lying inside the curve $y = \sqrt{2ax - x^2}$ is moving such that its shortest distance from the curve at any position is greater than its distance from X-axis. The point P enclose a region whose area is equal to

A. (a) $\frac{\pi a^2}{2}$

B. (b) $\frac{a^2}{3}$

C. (c) $\frac{2a^2}{3}$

D. (d) $\left(\frac{3\pi - 4}{6}\right)a^2$

Answer: C

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Exercise More Than One Correct Option Type Questions

1. The triangle formed by the normal to the curve $f(x) = x^2 - ax + 2a$ at the point (2,4) and the coordinate axes lies in second quadrant, if its area is 2 sq units, then a can be

A. 2

B. $17/4$

C. 5

D. None of these

Answer: B::C

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2. Let f and g be continuous function on $a \leq x \leq b$ and set $p(x) = \max\{f(x), g(x)\}$ and $q(x) = \min\{f(x), g(x)\}$. Then the area bounded by the curves $y = p(x), y = q(x)$ and the ordinates $x = a$ and $x = b$ is given by

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

B. (b) $\int_a^b |p(x) - q(x)| dx$

C. (c) $\int_a^b \{f(x) - g(x)\} dx$

D. (d) $\int_a^b \{p(x) - a(x)\} dx$

Answer: A::B::D

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3. The area bounded by the parabola $y = x^2 - 7x + 10$ and X-axis

A. $9/2$ sq units

B. $1/6$ sq units

C. $5/6$ sq units

D. None of these

Answer: A

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4. Find the area of the region bounded by the ellipse $\frac{x^2}{4} + \frac{y^2}{9}$ = 1

A. 6π sq units

B. 3π sq units

C. 12πsq units

D. area bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$

Answer: A::D

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5. There is curve in which the length of the perpendicular from the orgin to tangent at any point is equal to abscissa of that point. Then,

A. $x^2 + y^2 = 2$ is one such curve

B. $y^2 = 4x$ is one such curve

C. $x^2 + y^2 = 2cx$ (c parameters) are such curve

D. there are no such curves

Answer: A::C

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Exercise Statement I And Ii Type Questions

1. Statement I- The area of the curve $y = \sin^2 x 0 \to \pi$ will be more than that of the curve $y = \sin x 0 \to \pi$.

Statement II -$x^2 > x, \quad \text{if} \quad x > 1$.

A. Statement I is true, Statement II is also true, Statement II is the correct explanation of Statement I.

B. Statement I is true, Statement II is also true, Statement II is not the correct explanation of Statement I.

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: D

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2. Statement I- The area of bounded by the curves $y = x^2 - 3$ and $y = kx + 2$ is least if $k = 0$.

Statement II- The area bounded by the curves $y = x^2 - 3$ and $y = kx + 2 is \sqrt{k^2 + 20}$.

A. Statement I is true, Statement II is also true, Statement II is the correct explanation of Statement I.

B. Statement I is true, Statement II is also true, Statement II is not the correct explanation of Statement I.

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: C

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3. Statement I- The area of region bounded parabola $y^2 = 4x$ and $x^2 = 4y$ is $\frac{32}{3}$ sq units.

Statement II- The area of region bounded by parabola $y^2 = 4ax$ and $x^2 = 4by$ is $\frac{16}{3}ab$.

A. Statement I is true, Statement II is also true, Statement II is the correct explanation of Statement I.

B. Statement I is true, Statement II is also true, Statement II is not the correct explanation of Statement I.

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: D

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4. Statement I- The area by region $|x+y|+|x-y| \leq 2 \text{is} 4$ sq units.

Statement II- Area enclosed by region $|x+y|+|x-y| \leq 2$ is symmetric about X-axis.

A. Statement I is true, Statement II is also true, Statement II is the correct explanation of Statement I.

B. Statement I is true, Statement II is also true, Statement II is not the correct explanation of Statement I.

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: B

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5. Solve for x , $\frac{16}{x} - 1 = \frac{15}{x+1}$

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Exercise Passage Based Questions

1. Find the discriminant of the following quadratic equation :

$$2x^2 - 5x + 3 = 0$$

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2. Let $h(x) = f(x) - g(x)$, where $f(x) = \sin^4 \pi x$ and $g(x) = \log x$. Let $x_0, x_1, x_2, \ldots, x_{n+1}$ be the roots of $f(x) = g(x)$ in increasing order.

In the above question, the value of n is

A. 1

B. 2

C. 3

D. 4

Answer: B

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3. Let $f(x) = \frac{ax^2 + bx + c}{x^2 + 1}$ such that y=-2 is an asymptote of the curve $y = f(x)$. The curve $y = f(x)$ is symmetric about Y-axis and its maximum values is 4. Let $h(x) = f(x) - g(x)$,where $f(x) = \sin^4 \pi x$ and $g(x) = \log_e x$. Let $x_0, x_1, x_2 \ldots x_{n+1}$ be the roots of $f(x) = g(x)$ in increasing order

Then, the absolute area enclosed by $y = f(x)$ and $y = g(x)$ is given by

A. $\frac{11}{8}$

B. $\frac{8}{3}$

C. 2

D. $\frac{13}{3}$

Answer: A

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4. Consider the function $f: (-\infty, \infty) \to (-\infty, \infty)$ defined by $f(x) = \frac{x^2 - ax + 1}{x^2 + ax + 1}; 0 < a < 2$. Which of the following is true ?

A. $(2-a)^2 f(1) + (2-a)^2 f(-1) = 0$

B. $(2-a)^2 f(1)$-(2-a)^(2)f$(-1) = 0$

C. $f'(1) f'(-1) = (2-a)^2$

D. $f'(1) f'(-1) = -(2+a)^2$

Answer: A

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5. Consider the function $f:(-\infty, \infty) \to (-\infty, \infty)$ defined by $f(x) = \dfrac{x^2 - ax + 1}{x^2 + ax + 1}; 0 < a < 2$. Which of the following is true ?

A. f(x) is decreasing on $(-1, 1)$ and has a local minimum at x=1

B. f(x) is increasing on (-1,1) and has maximum at x=1

C. f(x) is increasing on (-1,1) but has neither a local maximum nor a local minimum at x=1`

D. f(x) is decreasing on (-1,1) but has neither a local maximum nor a local minimum at x=1.

Answer: A

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6. Find the discriminant of the following quadratic equation :

$x^2 + 2x + 4 = 0$

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7. Computing area with parametrically represented boundaries

If the boundary of a figure is represented by parametric equations $x = x(t), y = y(t)$, then the area of the figure is evaluated by one of the three formulae

$$S = -\int_{\alpha}^{\beta} y(t)x'(t)dt, S = \int_{\alpha}^{\beta} x(t)y'(t)dt$$

$$S = \frac{1}{2}\int_{\alpha}^{\beta}(xy' - yx')dt$$

where α and β are the values of the parameter t corresponding respectively to the beginning and the end of traversal of the contour .

The area enclosed by the astroid $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{a}\right)^{\frac{2}{3}} = 1$ is

A. (a) $\frac{3}{4}a^2\pi$

B. (b) $\frac{3}{18}\pi a^2$

C. (c) $\frac{3}{8}\pi a^2$

D. (d) $\frac{3}{4}a\pi$

Answer: C

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8. Find the value of discriminant of the following quadratic equation :

$6x^2 = 2x + 1$

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9. Find the discriminant of the following quadratic equation :

(x - 1)(2x - 1) = 0

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Area Of Bounded Regions Exercise 5 Matching Type Questions

1. Find the discriminant of the following quadratic equation :

$\sqrt{3x^2} + 2\sqrt{2x} - 2\sqrt{3} = 0$

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2. Find the discriminant of the following quadratic equation :

$x^2 + x + 2 = 0$

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Exercise Single Integer Answer Type Questions

1. Consider $f(x)=x^2-3x+2$ The area bounded by $|y|=|f(|x|)|, x\geq 1$ is A, then find the value of $3A+2$.

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2. Find the discriminant of the following quadratic equation :

$3x^2-2x+2=0$

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3. If the area bounded by $y=2-|2-x|$ and $y=\frac{3}{|x|}$ is $\frac{k-3\ln 3}{2}$, then k is equal to _____.

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4. Using integration find the area of triangle ABC, coordinates of whose vertices are A (2, 0), B (4, 5), C (6, 3).

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5. A point 'P' moves in xy plane in such a way that $[|x|] + [|y|] = 1$ where [.] denotes the greatest integer function. Area of the region representing all possible positions of the point 'P' is equal to:

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6. Let $f : [0, 1] \rightarrow \left[0, \frac{1}{2}\right]$ be a function such that $f(x)$ is a polynomial of 2nd degree, satisfty the following condition :

(a) $f(0) = 0$

(b) has a maximum value of $\frac{1}{2} at x = 1$.

If A is the area bounded by $y = f(x) = f^{-1}(x)$ and the line $2x + 2y - 3 = 0$ in 1st quadrant, then the value of 24A is equal to ....

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7. Let $f(x) = \min\left\{\sin^{-1}x, \cos^{-1}x, \frac{\pi}{6}\right\}, x \in [0, 1]$. If area bounded by $y = f(x)$ and X-axis, between the lines $x = 0$ and $x = 1 is \frac{a}{b\left(\sqrt{3}+1\right)}$. Then , (a-b) is ....

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8. Let $f(x)$ be a real valued function satisfying the relation $f\left(\frac{x}{y}\right) = f(x) - f(y)$ and $\lim_{x \to 0} \frac{f(1+x)}{x} = 3$. The area bounded by the curve $y = f(x)$, y-axis and the line $y = 3$ is equal to

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Exercise Subjective Type Questions

1. Find the continuous function f where $(x^4 - 4x^2) \leq f(x) \leq (2x^2 - x^3)$ such that the area bounded by $y = f(x), y = x^4 - 4x^2.$ then y-axis, and the line $x = t$, where $(0 \leq t \leq 2)$ is k times the area bounded by $y = f(x), y = 2x^2 - x^3$,y-axis ,and line $x = t(where 0 \leq t \leq 2).$

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2. Write the discriminant of the following quadratic equation :

$x^2 - 3x + 6 = 0$

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3. Let f(x)= minimum $\{e^x, 3/2, 1 + e^{-x}\}, 0 \leq x \leq 1.$ Find the area bounded by $y = f(x)$, X-axis and the line x=1.

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4. Find the area bounded by $y = f(x)$ and the curve $y = \frac{2}{1+x^2}$ satisfying the condition

$f(x), f(y) = f(xy) \,\forall x, y \in R$ and $f'(1) = 2, f(t) = 1,$

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5. The value of

$\int_0^{\sin^2 x} \sin^{-1}\sqrt{t}dt + \int_0^{\cos^2 x} \cos^{-1}\sqrt{t}dt$, is

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6. Find the value of discriminant of the following quadratic equation :

$9x^2 - 1 = 0$

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7. Find the value of discriminant of the following quadratic equation :

$x^2 + 6x + 5 = 0$

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8. Find the value of discriminant of the following quadratic equation :

$x^2 - 2x + k = 0$, where k is a real number.

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9. Determine whether the given quadratic equation have real roots and if so,find the roots

$x^2 + x + 2 = 0$

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10. If the circles of the maximum area inscriabed in the region bounded by the curves $y = x^2 - 2x - 3$ and $y = 3 + 2x - x^2$, then the area of region $y - x^2 + 2x + 3 \leq 0, y + x^2 - 2x - 3 \leq 0 \text{ and } s \leq 0.$

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11. Find limit of the ratio of the area of the triangle formed by the origin and intersection points of the parabola $y = 4x^2$ and the line $y = a^2$ to the area between the parabola and the line as a approaches to zero.

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12. Find the area of curve enclosed by $|x + y| + |x - y| \leq 4, |x| \leq 1, y \geq \sqrt{x^2 - 2x + 1}.$

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13. Determine whether the given quadratic equation have real roots and if so,find the roots

$2x^2 - x + 4 = 0$

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14. Find x , if $4\frac{1}{2} + 2\frac{3}{4} = x$

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15. Find x , if $\frac{5}{4} - \frac{7}{6} - \left(-\frac{2}{3}\right) = x$

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16. Find the value of x , if $x : 6 : : 5 : 3$

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17. The value of the parameter $a(a \geq 1)$ for which the area of the figure bounded by the pair of staight lines $y^2 - 3y + 2 = 0$ and the curves $y = [a]x^2, y = \frac{1}{2}[a]x^2$ is greatest is (Here [.] denotes the greatest integer function). (A) $[0, 1)$ (B) $[1, 2)$ (C) $[2, 3)$ (D) $[3, 4)$

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Area Of Bounded Regions Exercise 7 Subjective Type Questions

1. Solve $\frac{-5x}{3} + 2 = x - 6$

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Exercise Questions Asked In Previous 13 Years Exam

1. Area of the region

$\left\{(x, y) \in R^2 : y \geq \sqrt{|x + 3|}, 5y \leq x + 9 \leq 15\right\}$ is equal to

A. $\frac{1}{6}$

B. $\frac{4}{3}$

C. $\frac{3}{2}$

D. $\frac{5}{3}$

Answer: C

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2. Let $F(x) = \int_x^{x^2 + \frac{\pi}{2}} 2\cos^2 dt$ for all $x \in R$ and $f: \left[0, \frac{1}{2}\right] \rightarrow (0, \infty)$ 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

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3. The common tangents to the circle $x^2 = y^2 = 2$ and the parabola $y^2 = 8x$ touch the circle at the points P,Q and the parabola at the points

R,S. Then, the area (in sq units) of the quadrilateral PQRS is

A. 3

B. 6

C. 9

D. 15

Answer: D

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4. 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 $(a)4\left(\sqrt{2}-2\right)$ (b) $2\sqrt{2}$ ($\sqrt{2}$ -1) $(c)2\left(\sqrt{2}\right.$ +1) (d) $2\sqrt{2}\left(\sqrt{2}+1\right)$

A. $4\left(\sqrt{2}-1\right)$

B. $2\sqrt{2}\left(\sqrt{2}-1\right)$

C. $2\left(\sqrt{2}+1\right)$

D. $2\sqrt{2}(\sqrt{2}+1)$

Answer: B

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5. In Δ PQR, right-angled at Q, PR + QR = 30 cm and PQ = 10 cm. Determine the values of sin P, cos P and tan P.

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6. Let $f:[-1,2] \rightarrow [0,\infty)$ be a continuous function such that $f(x)=f(1-x)f \text{ or } all x \in [-1,2]$. Let $R_1 = \int_{-1}^{2} x f(x) dx,$ and R_2 be the area of the region bounded by $y=f(x), x=-1, x=2,$ and the x- axis . Then $R_1 = 2R_2$ (b) $R_1 = 3R_2$ (c) $2R_1 = R_2$ (d) $3R_1 = R_2$

A. $R_1 = 2R_2$

B. $R_1 = 3R_2$

C. $2R_1 = R_2$

D. $3R_1 = R_2$

Answer: C

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

Answer: B

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8. The area of the region bounded by the curve $y = e^x$ and lines $x = 0 and y = e$ is

A. $e - 1$

B. $\int_1^e In(e + 1 - y)dy$

C. $e - \int_0^1 e^x dx$

D. 1

Answer: B::C

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9. The area of the region bounded by the curves $y = \sqrt{\frac{1 + \sin x}{\cos x}}$ and $y = \sqrt{\frac{1 - \sin x}{\cos x}}$ bounded by the lines x=0 and $x = \frac{\pi}{4}$ is

A. A. $\int_0^{\sqrt{2}-1} \frac{t}{(1 + t^2)\sqrt{1 - t^2}} dt$

B. B. $\int_0^{\sqrt{2}-1} \frac{4t}{(1+t^2)\sqrt{1-t^2}} dt$

C. C. $\int_0^{\sqrt{2}=1} \frac{4t}{(1+t^2)\sqrt{1-t^2}} dt$

D. D. $\int_0^{\sqrt{2}+1} \frac{t}{(1+t^2)\sqrt{1-t^2}} dt$

Answer: B

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10. Find the product of (x - 4)(x - 7)

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11. Consider the function defined implicitly by the equation $y^3 - 3y + x = 0$ on various intervals in the real line. If $x \in (-\infty, -2) \cup (2, \infty)$, the equation implicitly defines a unique real-valued defferentiable function $y = f(x)$. If $x \in (-2, 2)$, the equation implicitly defines a unique real-valued diferentiable function $y - g(x)$

satisfying $g_0 = 0$.

$\int_{-1}^{1} g'(x)dx$ is equal to

A. $\int_a^b \frac{x}{3\left[\{f(x)\}^2 - 1\right]}dx + by(b) - af(a)$

B. $-\int_a^b \frac{x}{3\left[\{f(x)\}^2 - 1\right]}dx - by(b) + af(a)$

C. $\int_a^b \frac{x}{3\left[\{f(x)\}^2 - 1\right]}dx - by(b) + af(a)$

D. $-\int_a^b \frac{x}{3\left[\{f(x)\}^2 - 1\right]}dx + by(b) = af(a)$

Answer: A

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12. Consider the function defined implicitly by the equation $y^3 - 3y + x = 0$ on various intervals in the real line. If $x \in (-\infty, -2) \cup (2, \infty)$, the equation implicitly defines a unique real-valued defferentiable function $y = f(x)$. If $x \in (-2, 2)$, the equation implicitly defines a unique real-valued diferentiable function $y - g(x)$

satisfying $g_0 = 0$.

$\int_{-1}^{1} g'(x)dx$ is equal to

A. $2g(-1)$

B. 0

C. $-2g(1)$

D. $2g(1)$

Answer: D

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13. The area (in sqaure units) of the region $\{(x, y) : x \geq 0, x + y \leq 3, x^2 \leq 4y \text{ and } y \leq 1 + \sqrt{x}\}$ is

A. $\frac{5}{2}$

B. $\frac{59}{12}$

C. $\frac{3}{2}$

D. $\frac{7}{3}$

Answer: A

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14. The area (in sq. units) of the region $\{(x, y) : y^2 \geq 2x \text{ and } x^2 + y^2 \leq 4x, x \leq 0, y \geq 0\}$ is

A. $\pi - \frac{4}{3}$

B. $\pi - \frac{8}{3}$

C. $\pi - \frac{4\sqrt{2}}{3}$

D. $\frac{\pi}{2} - \frac{2\sqrt{2}}{3}$

Answer: B

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15. The area (in sq units) of the region described by $\{(x, y) : y^2 \leq 2x \text{ and } y \geq 4x - 1\}$ is

A. $\frac{7}{32}$

B. $\frac{5}{64}$

C. $\frac{15}{64}$

D. $\frac{9}{32}$

Answer: D

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16. The area (in sq. units) of the quadrilateral formed by the tangents at the end points of the latus rectum to the ellipse $\frac{x^2}{9} + \frac{y^2}{5} = 1$ is (a) $\frac{27}{4}$ (b) 18 (c) $\frac{27}{2}$ (d) 27

A. $\frac{27}{4}$

B. 18

C. $\frac{27}{2}$

D. 27

Answer: D

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17. The area of the region described by $A = \{(x, y) : x^2 + y^2 \leq 1 \text{ and } y^2 \leq 1 - x\}$ is

A. $\frac{\pi}{2} + \frac{4}{3}$

B. $\frac{\pi}{2} - \frac{4}{3}$

C. $\frac{\pi}{2} - \frac{2}{3}$

D. $\frac{\pi}{2} + \frac{2}{3}$

Answer: A

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18. The area bounded by the curves $y=\sqrt{x}, 2y+3=x,$ and x-axis in the 1st quadrant is 18 sq. units (b) $\frac{27}{4}\mathrm{s}\,\mathrm{qu}\,\mathrm{n}\,\dot{\mathrm{i}}\,\mathrm{t}\,\mathrm{s}$ $\frac{4}{3}\mathrm{s}\,\mathrm{qu}\,\mathrm{n}\,\dot{\mathrm{i}}\,\mathrm{t}\,\mathrm{s}$ (d) 9 sq. units

A. 18

B. 27/4

C. 4/3

D. 9

Answer: A

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19. The area bounded between the parabolas $x^2=\frac{y}{4}$ and $x^2=9y$ and the straight line y=2 is

A. $20\sqrt{2}$

B. $\frac{10\sqrt{2}}{3}$

C. $\frac{20\sqrt{2}}{3}$

D. $10\sqrt{2}$

Answer: C

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20. The area of the region enclosed by the curves $y = x, x = e, y = \frac{1}{x}$ and the positive x-axis is

A. 1 sq unit

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

C. $\frac{5}{2}$sq units

D. $\frac{1}{2}$ sq unit

Answer: B

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21. The area bounded by the y-axis, $y = \cos x$, and $y = \sin x$ when 0

A. $(4\sqrt{2} - 2)$sq units

B. $(4\sqrt{2} + 2)$sq units

C. $(4\sqrt{2} - 1)$sq units

D. $(4\sqrt{2} + 1)$sq units

Answer: A

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22. The area of the region bounded by the parabola $(y-2)^2 = x - 1$, the tangent to the parabola at the point $(2, 3)$ and the x-axis is

A. 6 sq units

B. 9 sq units

C. 12 sq units

D. 3 sq units

Answer: B

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23. The area of the plane region bounded by the curves $x + 2y^2 = 0$ and $x + 3y^2 = 1$ is equal to (1) $\frac{5}{3}$ (2) $\frac{1}{3}$ (3) $\frac{2}{3}$ (4) $\frac{4}{3}$

A. $\frac{5}{3}$ sq units

B. $\frac{1}{3}$ sq unit

C. $\frac{2}{3}$ sq unit

D. $\frac{4}{3}$ sq units

Answer: D

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