MATHS

BOOKS - ML KHANNA

AREA OF CURVES

Problem Set 1 Multiple Choice Questions

1. The area of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

A. πab

B. $\pi\left(a^2+b^2\right)/4$

C. $\pi(a+b)$

D. None

Answer: A

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2. If A_1, A_2, be the areas of the curves

$C_1 \quad x^2 + y^2 + 18x + 24y = 0$

and $c_2 \quad \frac{x^2}{14} + \frac{y^2}{13} = 1$ them

A. $A_1 > A_2$

B. $A_1 < A_2$

C. $A_1 = A_2$

D. none of these

Answer: A

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3. AOB is the positive quadrant of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ in which $OA=a, OB=b,$ The area between the arc AB and chord AB of the ellipse is

A. $\frac{1}{2}ab(\pi+2)$

B. $\frac{1}{4}ab(x-4)$

C. $\frac{1}{4}ab(\pi-2)$

D. None

Answer: C

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4. Find the smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line $x + y = 2$.

A. $2(\pi - 2)$

B. $(\pi - 2)$

C. $(2\pi - 1)$

D. None of these

Answer: B

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5. Area lying in the first quadrant and bounded by the circle $x^2 + y^2 = 4$ the line $x = \sqrt{3}y$ and x-axis , is

A. π

B. $\pi/2$

C. $\pi/3$

D. None of these

Answer: C

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6. Find the area bounded by the curve $y = \sqrt{x}, x = 2y + 3$ in the first quadrant and X-axis.

A. $2\sqrt{3}$

B. 18

C. 9

D. $34/3$

Answer: C

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7. The area cut off a parabola $4y = 3x^2$ by the straight line $2y = 3x + 12$ in square units, is

A. 16

B. 21

C. 27

D. 36

Answer: C

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8. The area enclosed between the curves $y^2 = x$ and $y = |x|$ is :

A. $2/3$

B. 1

C. $1/6$

D. $1/3$

Answer: C

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9. The area of the region bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is

A. $9/8$

B. $9/4$

C. $9/2$

D. None of these

Answer: A

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10. The area of the region bounded by the parabola $y^2 = 4ax$ and the line y=mx is

A. $\frac{5}{3}\frac{a^2}{m}$

B. $\frac{8}{3}\frac{a^2}{m^3}$

C. $\frac{7}{4}\frac{a^2}{m^2}$

D. None

Answer: B

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11. 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 $\sqrt{x-1}$ (b) $\sqrt{x+1}$ $\sqrt{x^2+1}$ (d) $\frac{x}{\sqrt{1+x^2}}$

A. $\sqrt{x-1}$

B. $\sqrt{x+1}$

C. $\sqrt{x^2+1}$

D. $\frac{x}{\sqrt{x^2+1}}$

Answer: D

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12. 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 $x = \frac{\pi}{4}$ and $x = \beta > \frac{\pi}{4}$ is :

$\left\{\beta \sin \beta + \frac{\pi}{4}\cos \beta + \sqrt{2}\beta\right\}$, then $f\left(\frac{\pi}{2}\right)$ is:

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

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

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

D. $\left(\frac{\pi}{4} - \sqrt{2} - 1\right)$

Answer: B

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13. The parabolas $y^2 = 4x$ and $x^2 = 4y$ divide the square region bounded by the lines x=4, y=4 and the coordinate

axes. If S_1, S_2, S_3 are the areas of these parts numbered from top to bottom, respectively, then

A. 2:1:2

B. 1:1:1

C. 1:2:1

D. 1:2:3

Answer: B

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14. The area of the region lying between the line $x - y + 2 = 0$ and the curve $x = \sqrt{y}$ and $y - a\xi s$, is

A. 9

B. $9/2$

C. $10/3$

D. None

Answer: C

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15. Find the area lying in the first quadrant and bounded by the curve $y = x^3$ and the line $y = 4x$.

A. 2

B. 3

C. 4

D. 5

Answer: C

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

A. -9

B. $-\frac{15}{4}$

C. $\frac{15}{4}$

D. $\frac{17}{4}$

Answer: D

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17. The area cut off from a parabola by any double ordinate is k time the corresponding rectangle contained by the double ordinate and its distance from the vertex. Find the value of k ?

A. $1/2$

B. $1/3$

C. $2/3$

D. 1

Answer: C

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18. Calculate the area bouded by the parabola $y^2 = 4ax$ and its latus rectum

A. $\frac{8}{3}a^2$

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

C. $\frac{4}{3}a$

D. $\frac{4}{3}a^2$

Answer: A

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19. Let A, be the area of the parabola $y2 = 4ax$ lying between vertex and latus rectum and A_2, be the area

between latus rectum and double ordinate $x = 2a$. Then $\frac{A_1}{A_2} = .$

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

B. $\left(2\sqrt{2} + 1\right)/7$

C. $\left(2\sqrt{2} - 1\right)/7$

D. None of these

Answer: B

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20. Area of the region bounded by the curve $y^2 = 4x$, y-axis and the line $y = 3$ is (A) 2 (B) $\frac{9}{4}$ (C) $\frac{9}{3}$ (D) $\frac{9}{2}$

A. 1 sq. units

B. $9/4$ sq. units

C. $6\sqrt{3}$ sq. units

D. None of these

Answer: B

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21. What is the area bounded by the curve $y = 4x - x^2 - 3$ and the x-axis?

A. $4/3$

B. $3/4$

C. 7

D. $3/2$

Answer: A

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22. Area between the curve $y = 4 + 3x - x^2$ and x-axis in square units , is

A. $125/3$

B. $125/4$

C. $125/6$

D. None

Answer: C

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23. Area bounded by the curves $x = 1, x = 3, xy = 1$ and x-axis is

A. log 2

B. log 3

C. log 4

D. None of these

Answer: B

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24. The area of the loop between the curve $y = a \sin x$ and x-axis is (A) a (B) $2a$ (C) $3a$ (D) none of these

A. a

B. 2a

C. 3a

D. None

Answer: B

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25. If A is the area between the curve $y = \sin x$ and x-axis in the interval $[0, \pi/4]$, then in the same interval , area

between the curve $y = \cos x$ and x-axis, is

A. A

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

C. $1 - A$

D. None of these

Answer: C

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26. If A is the area lying between the curve $y = \sin x$ and x-axis between x=0 and $x = \pi/2$. Area of the region between the curve $y = \sin 2x$ and x-axis in the same interval is given by

A. $A/2$

B. A

C. 2A

D. None of these

Answer: B

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27. Area bounded by the curves $y = x \sin x$ and x-axis between $x = 0$ and $x = 2\pi$ is

A. 2π

B. 3π

C. 4π

D. None of these

Answer: C

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28. The area bounded by $y = \cos x$ and $x = -\frac{\pi}{2}$ and $x = 2\pi$.and the axis of xin square units is

A. 4

B. 5

C. 6

D. 7

Answer: B

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29. Area bounded by the curves $y = \sin^4 x, x = 0, x = \frac{\pi}{2}$ and $y = 0$ is

A. $3/8$

B. $3/16$

C. $3\pi/16$

D. None of these

Answer: C

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30. Area of the region bounded by the curves y = tan x, y = cot x and X-axis in $0 \leq x \leq \frac{\pi}{2}$ is

A. log 2

B. $\frac{1}{2}\log 2$

C. $\frac{1}{2}(\log 2 - 1)$

D. None of these

Answer: A

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31. Find the area of the region bounded by the curve $C: y = \tan x, tan \geq ntdrawn \to C$ at $x = \frac{\pi}{4}$, and the x-

axis.

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

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

C. $\frac{1}{2}(\log 2 - 1)$

D. None

Answer: B

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32. Area lying between the curves $y^2 = 4x$ and $y = 2x$ is

A. $2/3$

B. $1/3$

C. $1/4$

D. None of these

Answer: B

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33. Find the area bounded by the curves $y = 2x - x^2$ and the straight line $y = -x$.

A. $9/2$

B. $43/6$

C. $35/6$

D. None of these

Answer: A

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34. The area of the region bouned by the curve $y = 2x - x^2$ and the line $y = x$ is

A. $1/2$

B. $1/3$

C. $1/4$

D. $1/6$

Answer: D

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35. Find the area enclosed by the parabola $y = 2 - x^2$ and the straight line x + y = 0

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

B. $\frac{34}{7}$

C. $\frac{9}{2}$

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

Answer: C

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36. The area of the figure bounded by the curves $y^2 = 2x + 1$ and $x - y - 1 = 0$, is

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

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

C. $\frac{16}{3}$

D. None of these

Answer: C

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37. Find the area bounded by the parabola $y^2 = 4x$ and the straight line $x + y = 3$.

A. $\frac{16}{3}$

B. $\frac{32}{3}$

C. $\frac{64}{3}$

D. None of these

Answer: C

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38. The area betweem the curves $y = \sin^{-1} x$ and $y = \cos^{-1} x$ and axis of x is

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

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

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

D. $\left(3+2\sqrt{2}\right)$

Answer: B

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39. If the ordinate $x = a$ divides the area bounded by the curve $y = \cos^{-1} x$ and axis of x. Then value of a is.

A. $2\sqrt{3}$

B. $2\sqrt{2}$

C. 3

D. None of these

Answer: B

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40. Find the area bounded by the curve $|x| + y = 1$ and axis of x.

A. 4

B. 2

C. 1

D. $1/2$

Answer: C

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41. Find area enclosed by $|x| + |y| = 1$.

A. 4

B. 2

C. 1

D. $1/2$

Answer: B

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42. Find the area bounded by the curve $y = (x-1)(x-2)(x-3)$ lying between the ordinates $x = 0 and dx = 3.$

A. $\frac{9}{4}$

B. $\frac{11}{4}$

C. $\frac{11}{2}$

D. None

Answer: B

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43. Area bounded by the curve $y = x(x-1)(x-2)$ and axis of x is equal to

A. 1

B. $1/2$

C. $1/4$

D. none of these

Answer: B

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44. The area bounded by the curve $y^2(2a - x) = x^3$ and the line x = 2a is

A. $3\pi a^2$

B. $3\pi a^2 / 2$

C. $3\pi a^2 / 4$

D. None of these

Answer: A

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45. the area included between the curve $xy^2 = a^2(a - x)$ and y -axis is -

A. $\pi a^2 / 2$

B. πa^2

C. $3\pi a^2$

D. None

Answer: B

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46. Area bounded by the loop of the curve $ay^2 = x^2(a - x)$ is equal to

A. $\frac{4}{15}a^2$

B. $\frac{8}{15}a^2$

C. $\frac{16}{15}a^2$

D. None

Answer: B

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47. The whole area between the curve $y^2(a-x)=x^2(a+x), a>0$ and its aympototes is equal to

A. $2a^2\left(1+\frac{\pi}{4}\right)$

B. $2a^2\left(1+\frac{\pi}{3}\right)$

C. $a^2\left(1+\frac{\pi}{4}\right)$

D. $a^2\left(1+\frac{\pi}{3}\right)$

Answer: A

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48. The area enclosed between the curve $y=\log_e(x+e)$ and the coordinate axes is

A. 3

B. 4

C. 1

D. 2

Answer: C

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49. The area included between the parabolas $y^2 = 4ax$ and $x^2 = 4by$ is

A. $\frac{8}{3}ab$

B. $\frac{16}{3}ab$

C. $\frac{4}{3}ab$

D. None

Answer: B

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50. Area common to the curves $y = \sqrt{x}$ and $x = \sqrt{y}$ is (A) 1 (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) none of these

A. 1

B. $2/3$

C. $1/3$

D. None of these

Answer: C

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51. The area inside the parabola $5x^2 - y = 0$ but outside the parabola $2x^3 - y + 9 = 0$ is

A. $12\sqrt{3}$

B. $6\sqrt{3}$

C. $8\sqrt{3}$

D. $4\sqrt{3}$

Answer: A

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52. If the area enclosed between the curves $y = ax^2 and x = ay^2 (a > 0)$ is 1 square unit, then find the value of a.

A. $1/\sqrt{3}$

B. $1/2$

C. 1

D. $1/3$

Answer: A

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53. The area common to the parabolas $y = 2x^2$ and $y = x^2 + 4$ (in square units) is (A) $\frac{2}{3}$ (B) $\frac{3}{2}$ (C) $\frac{32}{3}$ (D) $\frac{3}{32}$

A. $16/3$

B. $8/3$

C. $32/3$

D. None of these

Answer: C

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54. Find the area of the figure bounded by the parabolas $x = -2y^2, x = 1 - 3y^2.$

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

B. $\frac{6}{3}$

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

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

Answer: C

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55. The area common to the circle $x^2 + y^2 = 16a^2$ and the parabola $y^2 = 6ax$ is

A. $\frac{4a^2}{3}\left(4\pi - \sqrt{3}\right)$

B. $\frac{4a^2}{3}(8\pi - 3)$

C. $\frac{4a^2}{3}\left(4\pi + \sqrt{3}\right)$

D. None

Answer: C

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56. Area common to the circle $x^2 + y^2 = 64$ and the parabola $y^2 = 6ax$ is

A. $\frac{16}{3}(4\pi + \sqrt{3})$

B. $\frac{16}{3}(8\pi - \sqrt{3})$

C. $\frac{16}{3}(4\pi - \sqrt{3})$

D. None

Answer: B

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57. Area included between the parabola $y = \frac{x^2}{4}a$ and the witch of Agnesi $y = \frac{8a^3}{x^2 + 4a^2}$ is

A. $\frac{a^2}{3}(6\pi - 4)$

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

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

D. None

Answer: A

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58. The area of the region between 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. $\int_0^{\sqrt{2}-1} \frac{1}{(1+t^2)\sqrt{1-t^2}} dt$

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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59. The area of the figure bounded by the curve $|y| - 1 - x^2$, is

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

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

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

D. None

Answer: C

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60. The area bounded by the curves $y = (x-1)^2, y = (x+1)^2$ and $y = \frac{1}{4}$ is

A. $1/6$

B. $2/3$

C. $1/4$

D. $1/3$

Answer: D

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61. The area of region bounded by $y = |x - 1|$ and $y = 1$ is

A. 1

B. 2

C. $1/2$

D. None

Answer: A

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62. The area of the region bounded by the curve $y = |x - 2|, x = 1, x = 3$ and the X-axis is

A. 1

B. 2

C. 3

D. 4

Answer: A

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63. The area of the region bounded by the curves $y = |x - 1|$ and $y = 3 - |x|$ is-

A. 2

B. 3

C. 4

D. 6

Answer: C

64. 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

Answer: C

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65. 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. $3 \log 2 + \frac{4}{3}$

Answer: A

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66. 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. $\int_0^e In \quad y \quad dy$

Answer: B::C

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67. The ratio of the area of the region bounded by the curve $a^4y^2 = (2a - x)x^5$ to the area of the circle whose

radius is a, is given by

A. 4:5

B. 5:4

C. 2:3

D. 3:2

Answer: B

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68. Find the value of 'c' for which the area of the figure bounded by the curve, $y = 8x^2 - x^5$, the straight lines x = 1 and x = c and the abscissa axis is equal to $16/3$.

A. 2

B. $\sqrt{8-\sqrt{17}}$

C. 3

D. none

Answer: D

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69. The area between the curves $y = \sin x$ and $y = \cos x$ bounded by the lines $x = 0$ and $x = \pi/2$ is

A. $\sqrt{2}-1$

B. 0

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

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

Answer: D

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70. The area bounded by $y = xe^{|x|}$ and the lines $|x| = 1, y = 0$ is

A. 4

B. 6

C. 1

D. 2

Answer: D

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71. The volume of the solid obtained by revolving about y-axis the area enclosed between the ellipse $x^2 + 9y^2 = 9$ and the strangth line $x + 3y = 3$, in the first quadrant is

A. 3π

B. 4π

C. 6π

D. 9π

Answer: D

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72. The slope of the tangent to a curve $y = f(x) at \{x, f(x)\}$ is $2x + 1$. If the curve passes through the point $(1, 2)$, then the area bounded by the curve, the x-axis and the line $x = 1$ is

A. $5/6$

B. $6/5$

C. $1/6$

D. 6

Answer:

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73. For which of the following values of m is the area of the regions bounded by the curve $y = x - x^2$ and the line $y = mx$ equal $\frac{9}{2}$? -4 (b) -2 (c) 2 (d) 4

A. -4

B. -2

C. 2

D. 4

Answer:

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Problem Set 1 True And False

1. Find the smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line $x + y = 2$.

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2. Area of the region bounded by curves $y = x^2 + 2, y = x, x = 0$ and $x = 1 is \frac{7}{16}$.True or False

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3. Area bounded by the curve

$$y = \begin{cases} x^2 : x < 0 \\ x : x \geq 0 \end{cases}$$

and the line $y = 4$ is $20/3$. True or False

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4. Area bounded by the curves $y = |x - 1|, y = 0$ and $|x| = 2 is 5$. True or False

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5. Area enclosed between the curve $ay = 3\left(a^2 - x^2\right)$ and the X-axis is

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6. The area between the curves $y = x^2$ and $y = \frac{2}{1 + x^2}$ is equal to

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7. The area bounded by the parabola $y = x^2$ and the line $y = 2xis4/3$ sq. units.

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8. The area included between the parabolas $y^2 = 4ax(x + a)$ and $y^2 = 4b(b - x)is\frac{8}{3}\sqrt{ab}(a + b)$ .True False

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9. The area between the parabolas $y^2 = 4x, y^2 = x$ and $x = 1, x = 4is\frac{28}{8}$ sq. units.True or False

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Problem Set 1 Fill In The Blanks

1. Find the area of the region lying in the first quadrant and bounded by $y = 4x^2, x = 0, y = 1 and y = 4.$

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2. Area between the parabola $y^2 = 9x$ and the line $y = x$ is .....

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3. The area common to the curve $y^2 = x$ and $x^2 = y$ is .....

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4. Find the ratio in which the area bounded by the curves $y^2 = 12x and x^2 = 12y$ is divided by the line $x = 3$.

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5. The area bounded by the normal at $(1, 2)$ to the parabole $y^2 = 4x$, x-axis and the curve is .....

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$$f(x) = \begin{cases} x^2 : x < 0 \\ x : x \geq 0 \end{cases}$$

6. Let .Area bounded by the curve $y = f(x), y = 0$ and $x^2 = 9a^2 is 9\frac{a}{2}$ Then $a =$ .....

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7. Area of the region bounded by the curve $y = \sin^2 x$ and $x = 0, y = 0$ and $x = \pi/2$ is .....

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8. The area bounded by the hyperbola $x^2 - y^2 = a^2$ between the straigth lines $x = a$ and $x = 2a$ is .....

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9. Area of the segment cut off from the parabola $y^2 = 4x$ by the line $y = 8x - 1$ is .....

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10. Area of the region lying between the curve $y = x^3$ and the line $y = x$ is .....

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11. Find the area lying above x-axis and included between the circle $x^2 + y^2 = 8x$ and the parabola $y^2 = 4x$.

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12. The line $y = mx$ bisects the area enclosed by the curve $y = 1 + 4x - x^2$ and the lines $x = 0, x = \frac{3}{2} and y = 0$. Then the value of m is $\frac{13}{6}$ b. $\frac{6}{13}$ c. $\frac{3}{2}$ d. 4

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13. Sketch the curves and identify the region bounded by $x = 1/2, x = 2, y = \log_e x$ and $y = 2^x$. The area of this region is .....

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14. Indicate the region bounded by the curves $x^2 = y, y = x + 2$ and x-axis and the area enclosed by them is .....

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15. Find the area of the closed figure bounded by the curves $y = \sqrt{x}, y = \sqrt{4 - 3x} and y = 0$

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Self Assessement Test

1. The value(s) of $\int_0^1 \frac{x^4(1-x)^4}{1+x^2}dx$ is (are)

A. $\frac{22}{7} - \pi$

B. $\frac{2}{105}$

C. 0

D. $\frac{71}{51} - 3\frac{\pi}{2}$

Answer: A

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2. The value of the integral

$$\int_{-\pi/2}^{\pi/2} \left\{x^2 + \log\left(\frac{\pi+x}{\pi-x}\right)\right\} \cos x dx \text{is}$$

A. 0

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

C. $\frac{\pi^2}{2} + 4$

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

Answer: B

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3. The value of $\int_{\sqrt{\log 2}}^{\sqrt{\log 3}} \frac{x \sin x^2}{\sin x^2 + \sin(\log 6 - x^2)} dx$ is

A. $\frac{1}{4} \log \frac{3}{2}$

B. $\frac{1}{2} \log \frac{3}{2}$

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

D. $\frac{1}{6}\log\frac{3}{2}$

Answer: A

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4. $\int_0^{\pi}[\cot x]dx,$ where [.] denotes the greatest integer function, is equal to

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

B. 1

C. -1

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

Answer: D

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5. Let $p(x)$ be a function defined on R such that $p'(x) = p'(1-x)$ for all $x\varepsilon[0,1], p(0) = 1,$ and $p(1) = 41.$

Then $\int_0^1 p(x)dx$ is equal to

A. $\sqrt{41}$

B. 21

C. 41

D. 42

Answer: B

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6. If $g(x) = \int_0^x \cos^4 t dt$, then $g(x+\pi)$ equals

A. $\frac{g(x)}{g(\pi)}$

B. $g(x) + g(\pi)$

C. $g(x) - g(\pi)$

D. $g(x).\, g(\pi)$

Answer: B

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7. Let f be a non-negative function defined on the interval[0,1]. If

$\int_0^x \sqrt{1-(f'.t)^2}.dt = \int_0^x f(t)dt, 0 \leq x \leq 1$ and $f(0) = 0$

,then

A. $f\left(\frac{1}{2}\right) < \frac{1}{2}$ and $f\left(\frac{1}{3}\right) > \frac{1}{3}$

B. $f\left(\frac{1}{2}\right) > \frac{1}{2}$ and $f\left(\frac{1}{3}\right) > \frac{1}{3}$

C. $f\left(\frac{1}{2}\right) < \frac{1}{2}$ and $f\left(\frac{1}{3}\right) < \frac{1}{3}$

D. $f\left(\frac{1}{2}\right) > \frac{1}{2}$ and $f\left(\frac{1}{3}\right) < \frac{1}{3}$

Answer: C

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8. Let the straight line x = b divide the area enclosed by $y = (1-x)^2, y = 0$ and $x = 0$ into two parts

$R_1(0 \leq x \leq b)$ 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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9. 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. 3

B. 6

C. 9

D. 12

Answer: C

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10. Let $f:[-1,2] \to [0,\infty)$ be a continuous function such that $f(x) = f(1-x), \forall x \in [-1,2]$. If $R_1 = \int_{-1}^{2} xf(x)dx$ and R_2 are the area of the region bounded by $y = f(x), x = -1, x = 2$ and the X-axis. Then :

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

A. $\frac{1}{2}$ sq. units

B. 1 sq. units

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

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

Answer: C

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12. The area bounded by the curves y = cos x and y = sin x between the ordinates x = 0 and $x = \frac{3\pi}{2}$, is

A. $4\sqrt{2} - 2$

B. $4\sqrt{2} + 2$

C. $4\sqrt{2} - 1$

D. $4\sqrt{2} + 1$

Answer: A

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13. The value of $\lim_{x \to 0} \frac{1}{x^3} \int_0^x \frac{t \ln(1+t)}{t^4+4} dt$

A. 0

B. $\frac{1}{12}$

C. $\frac{1}{24}$

D. $\frac{1}{64}$

Answer: B

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14. Let S be the area of the region enclosed by $y = e^{-x} \hat{} 2, y = 0, x = 0, and x = 1.$ Then $S \geq \frac{1}{e}$ (b) $S \geq 1 = \frac{1}{e}$ $S \leq \frac{1}{4}\left(1 + \frac{1}{\sqrt{e}}\right)$ (d) $S \leq \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{e}}\left(1 - \frac{1}{\sqrt{2}}\right)$

A. $S \geq \frac{1}{e}$

B. $S \leq \frac{1}{e}$

C. $S \leq \frac{1}{4}\left(1 + \frac{1}{\sqrt{e}}\right)$

D. $S \leq \frac{1}{4}\left(1 - \frac{1}{\sqrt{2}}\right)$

Answer: A::B::C::D

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15. For any real number x, let $[x]$= largest integer less than or equalto x. Let f be a real valued function defined on the interval$[-10, 10]$ by

$$f(x)=\begin{cases} x-[x] & \text{if}[x] \text{ is odd} \\ 1+[x]-x & \text{if}[x] \text{ is even} \end{cases}$$

Then, the value of $\left(\frac{\pi}{10}\right)^2\left(\int_{-10}^{10} f(x)\cos \pi x dx\right.$ is

A. 4

B. 5

C. 6

D. 1

Answer: A

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16. The area (in square units) bounded by the curves $y = \sqrt{x}, 2y - x + 3 = 0,$ x-axis, and lying in the first quadrant is

A. 9

B. 36

C. 18

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

Answer: A

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