MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

APPLICATION OF INTEGRALS

Solved Examples And Exercises

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

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2. Find the area of the smaller part of the circle $x^2 + y^2 = a^2$ cut off by the line $x = \frac{a}{\sqrt{2}}$

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3. Find the area bounded by $x = at^2$ and $y = 2at$ between the ordinates corresponding to $t = 1$ and $t = 2$.

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4. Find the area enclosed by the curve $x = 3\cos t, y = 2\sin t$

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5. Sketch the region lying in the first quadrant and bounded by $y = 9x^2, x = 0, y = 1 and y = 4.$ Find the area of the region using integration.

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6. Find the area of the region bounded by $y = -1, y = 2, x = y^3$ and $x = 0.$

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7. Find the area of the region included between the parabolas $y^2 = 4axandx^2 = 4ay, wherea > 0.$

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8. Find the area of the region bounded by the curve $y - 3$ and the lines $y = x + 6$ and $y = 0.$

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9. Find the area bounded by the curves $y = xandy = x^3.$

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

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11. Find the area of the region between the parabola $x = y^2 - 6y$ and the line $x = -y$

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12. Find the area of the region bounded by the parabola $y = x^2$ and $y = |x|$.

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13. Determine the area under the curve $y = \sqrt{a^2 - x^2}$ included between the lines $x = 0 and x = a.$

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14. Find the area of the region bounded by the parabola $y^2 = 2x$ and straight line $x - y = 4.$

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15. Find the area of the region bounded by the curves $y = x^3$ and the lines $y = x + 6$ and $y = 0$.

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16. Using integration, find the area of the region bounded by the line $2y = -x + 8$,x-axis is and the lines $x = 2$ and $x = 4$.

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17. If the area above $x -$ a xi s , bounded by the curves $y = 2^{kx} and x = 0 and x = 2 is \frac{3}{(\log)_e 2}$, then find the

value of k

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18. Using integration, find the area of the region bounded by the line $y-1=x, the x-\text{axis}$ and the ordinates $x=-2 and x=3$.

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

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

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21. Sketh the graph $y = |x + 1|$. Evaluate $\int_{-3}^{1} |x + 1| dx$. What does this value represent on the graph?

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22. Compute the area bounded by the lines x + 2y = 2 , y -x = 1 and 2x + y = 7.

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23. Find the area of the region $\{(x, y) : x^2 + y^2 \leq 4,\ x + y \geq 2\}$

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24. Using integration, find the area of the region bounded by the following curves after making a rough sketch: $y = 1 + |x + 1|, x = -2, x = 3, y = 0.$

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25. Draw a rough sketch of the curves $y = \sin x$and $y = \cos x$ varies from 0 to $\frac{\pi}{2}$ and find the area of the region enclosed by them and x-axis

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

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

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

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29. Find the area bounded by the curves $y = 6x - x^2 and y = x^2 - 2x.$

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30. Find the area of the region bounded by $y = \sqrt{x} and y = x.$

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31. Calculate the area of the region bounded by the parabolas $y^2 = 6x and x^2 = 6y.$

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32. If the area bounded by the parabola $y^2 = 4ax$ and the line y=mx is $\frac{a^2}{12}$ sq. units, by using integration find the value of m.

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33. If the area enclosed by the parabolas $y^2 = 16axandx^2 = 16ay, a > 0is\frac{1024}{3}sq.$ units, find the value of $a.$

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34. Find the area bounded by the lines $y = 4x + 5, y = 5 - xand4y = x + 5.$

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35. Find the area enclosed by the curves $y = |x - 1|andy = -|x - 1| + 1.$

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36. Examples: Find the area bounded by the parabola $y^2 = 4ax$ and its latus rectum.

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37. Using integration, find the area of the region bounded by the parabola $y^2 = 16x$ and the line $x = 4$

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

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39. Draw a rough sketch of the curve $y = \cos^2 x$ in $[0, 1]$ and find the area enclosed by the curve,the lines

$x = 0, x = \pi$ and the x-axis.

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40. Find the area of the region bounded by the line $y = 3x + 2$, the x-axis and the ordinates $x = -1$ and $x = 1$

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41. Using the method of integration find the area bounded by the curve $|x| + |y| = 1$.

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42. Find the area lying above the x-axis and under the parabola $y = 4x - x^2$

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43. Draw a rough sketch to indicate the region bounded between the curve $y^2 = 4ax$ and the line $x = 3$. also, find the area of this region.

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44. Make a rough sketch of the graph of the function $y = 4 - x^2,\ 0 \leq x \leq 2$ and determine the area

enclosed by the curve, the x-axis and the lines $x = 0 \, and \, x = 2.$

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45. Using integration, find the area bounded by the lines x+2y=2, y−x=1 and 2x+y=7

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46. Find the area under the curve $y = \sqrt{6x + 4}$(above the x-axis) from x=0 to x=2

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47. Draw the rough sketch of $y^2 + 1 = x,\ x \leq 2.$ Find the area enclosed by the curve and the line $x = 2.$

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48. Draw a rough sketch of the graph of the curve $\frac{x^2}{4} + \frac{y^2}{9} = 1$ and evaluate the area of the region under the curve and above the x-axis.

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49. Using integration, find the area of the region bounded by the line 2y = 5x + 7, the x-axis, and the lines x = 2 and x = 8.

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50. Sketch the graph of $y = |x - 5|$. Evaluate $\int_0^1 |x - 5| dx$. What does this value of the integral represent on the graph.

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51. Sketch the graph of $y = |x + 3|$. Evaluate $\int_{-6}^{0} |x + 3| dx$. What does the value of this integral represent?

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52. The area of the region bounded by the curve $xy - 3 - 2y - 10 = 0$, X-axis and the lines $x = 3, x = 4$, is

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53. Draw a rough sketch of the curve $y = \frac{x}{\pi} + 2\sin^2 x$, and find the area between the x-axis, the curve and the ordinates $x = 0$ and , $x = \pi$.

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54. Draw a rough sketch of the curve $y = \frac{x}{\pi} + 2\sin^2 x$, and find the area between the x-axis, the curve and the ordinates $x = 0$ and , $x = \pi$.

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55. Find the area bounded by the curve $y = \cos x$, x-axis and the ordinates $x = 0\, and\, x = 2\pi$.

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56. Find the area bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$and the ordinates $x = 0$and$x = ae$, where, $b^2 = a^2\left(1 - e^2\right)ande < 1$.

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

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58. Find the area bounded by the curve $y^2 = 4ax$ and the lines $y = 2\, and$ y-axis.

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59. 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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60. Find the area of the region bounded by $x^2 = 16y,\ y = 1,\ y = 4$ and the y-axis in the first quadrant.

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61. Find the area enclosed between the parabola $4y = 3x^2$ and the straight line $3x - 2y + 12 = 0$

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62. Find the area bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$.

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63. Find the area enclosed between the parabola $y^2 = 4ax$and the line $y = mx$.

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

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65. Find the area of the region bounded by $y = \sqrt{x} and y = x$.

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66. क्षेत्र

$\{(x, y) : 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$

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67. 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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68. Find the area of the region $\{(x, y): y^2 \leq 4x, 4x^2 + 4y^2 \leq 9\}$

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69. Find the area of the region enclosed between the two circles $x^2 + y^2 = 1$ and $(x - 1)^2 + y^2 = 1$

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70. Prove that the curves $y^2 = 4x$ and $x^2 = 4y$ divide the area of the square bounded by $x = 0, x = 4, y = 4 and y = 0$ into three equal parts.

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71. Find the area bounded by the curve $4y^2 = 9x$ and $3x^2 = 16y$

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72. Find the area of the region bounded by $y = \sqrt{x} and y = x.$

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73. Find the area bounded by the curves $y = 4 - x^2$ and the lines $y = 0$ and $y = 3$

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74. Using integration, find the area of the triangle ABC whose vertices are $A(-1, 1)$, $B(0, 5)$ and $C(3, 2)$.

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75. Using integration find the area of the triangular region whose sides have equations $y = 2x + 1,\ y = 3x + 1$ and $x = 4$

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76. Find the area of the region enclosed between the two circles: $x^2 + y^2 = 4$and $(x - 2)^2 + y^2 = 4.$

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77. Using integration, find the area of the region common to the circle $x^2 + y^2 = 16$ and the parabola

$y^2 = 6x$.

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78. Find the area of the region included between the parabola $y^2 = x$ and the line $x + y = 2$.

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79. Draw a rough sketch of the region $\{(x, y) : y^2 \leq 3x, 3x^2 + 3y^2 \leq 16\}$ and find the ara enclesed by the region using the method of intergraion

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80. Draw a rough sketch and find the area of the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$, using the method of integration.

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81. Find the area of the region in the first quadrant enclosed by x-axis, line $x = \sqrt{3}y$ and the circle $x^2 + y^2 = 4$.

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82. Find the area common to the circle $x^2 + y^2 = 16a^2$ and the parabola $y^2 = 6ax, a > 0$.

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

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84. 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)

$\frac{3}{32}$

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85. Find the area of the region bounded by the curves $y = x - 1$ & $(y-1)^2 = 4(x+1)$.

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

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87. Using the method of integration, find the area of the region bounded by the following lines $3x - y - 3 = 0, 2x + y - 12 = 0, x - 2y - 1 = 0.$

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88. Find the area bounded by the curves $x = y^2$ and $x = 3 - 2y^2.$

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89. Find the area of the region in the first quadrant enclosed by the x-axis, the line $y = x$ and the circle $x^2 + y^2 = 32.$

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90. Find the area of the circle $x^2 + y^2 = 16 which is exterior \to the parabola y^2 = 6x$ by using integration.

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91. Find the area of the region enclosed by the parabola $x^2 = y$, the line $y = x + 2$ and the x-axis.

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92. Make a rough sketch of the region given below and find its area using integration $\{(x, y): 0 \leq y \leq x^2 + 3, 0 \leq y \leq 2x + 3, 0 \leq x \leq 3\}$.

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93. Find the area of the region $\{(x, y) : x^2 + y^2 \leq 4, x + y \geq 2\}$

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94. In what ratio does the x-axis divide the area of the region bounded by the parabolas $y = 4x - x^2 and y = x^2 - x$?

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95. Using integration, find the area bounded by the curves $y = |x - 1|$ and $y = 3 - |x|$.

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96. Find the area of the region between the parabola $x = 4y - y^2$ and the line $x = 2y - 3$.

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97. The area bounded by the parabolay $y^2 = 4x$ and the line $y = 2x - 4$ on the Y-axis.

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

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99. Find the area included between the curves $x^2 = 4y$ and $y^2 = 4x$.

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100. The area bounded by the curve $y = \log_e x$, the x-axis and the line $x = e$ is (A) e sq. units (B) 1 sq. unit (C) $\left(1 - \frac{1}{e}\right)$ sq. units (D) $\left(1 + \frac{1}{e}\right)$ sq. units

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101. If A_n be the area bounded by the curve $y = (\tan x^n)$ ands the lines $x = 0,\ y = 0,\ x = \pi/4$

Prove that for $n > 2.$, $A_n + A_{n+2} = \frac{1}{n+1}$ and deduce $\frac{1}{2n+2} < A_n < \frac{1}{2n-2}$

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102. The area enclosed between the curves $y = (\log)_e(x+e), x = (\log)_e\left(\frac{1}{y}\right),$ and the x-axis is $2sq\dot{u}nits$ (b) $1sq\dot{u}nits$ $4sq\dot{u}nits$ (d) none of these

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103. The area of the figure bounded by the parabola $(y-2)^2 = x-1,$ the tangent to it at the point with

the ordinate $x = 3$, and the $x - a\xi s$ is $7sq\grave{u}nites$ (b) $6sq\grave{u}nites$ $9sq\grave{u}nites$ (d) None of these

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104. Find the area bounded by the parabola $y = x^2 + 1$ and the straight line $x + y = 3$.

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105. The ratio of the areas between the curves $y = \cos x$ and $y = \cos 2x$ and x-axis from $x = 0$ to $x = \frac{\pi}{3}$ is (A) $1:3$ (B) $2:1$ (C) $\sqrt{3}:1$ (D) none of these

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106. Area between the x-axis and the curve $y = \cos x$, when $0 \leq x \leq 2\pi$ is (A) 0 (B) 2 (C) 3 (D) 4

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107. Area bounded by the parabola $y^2 = x$ and the line $2y = x$ is (A) $\frac{4}{3}$ (B) 1 (C) $\frac{2}{3}$ (D) $\frac{1}{3}$

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108. The area enclosed between the curve $y^2(2a - x) = x^3$ and the line $x = 2$ above the

$x - a\xi s$ is $\pi a^2 squnits$ (b) $\frac{3\pi a^2}{2} squnits$ $2\pi a^2 squnits$

(d) $3\pi a^2 squnits$

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109. The area bounded by the curves $y = f(x)$, the x-axis, and the ordinates $x = 1 and x = b$ is $(b-1)\sin(3b+4)\cdot$ Then $f(x)$ is. $(x-1)\cos(3x+4)$

$\sin(3x+4)$ $\sin(3x+4) + 3(x-1)\cos(3x+4)$

None of these

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110. The area bounded by the curve $y^2 = 8x \; and \; x^2 = 8y$ is $\frac{16}{3} squnits$ b. $\frac{3}{16} squnits$ c. $\frac{14}{3} squnits$ d. $\frac{3}{14} squnits$

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111. 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) $\frac{17}{4}$

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112. The area bounded by the curve $y = x|x|$, x-axis and the ordinates $x = -1, x = 1$ is (A) $\frac{5}{3}$ (B) $\frac{4}{3}$ (C) $\frac{2}{3}$ (D) $\frac{1}{3}$

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113. The area bounded by the y-axis, $y = \cos x$and $y = s \in x$when $0 \leq x \leq \frac{\pi}{2}$is(A) $2\left(\sqrt{2-1}\right)$ (B) $\sqrt{2} - 1$ (C) $\sqrt{2} + 1$ (D) $\sqrt{2}$

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114. The area of the circle $x^2 + y^2 = 16$exterior to the parabola $y^2 = 6x$is(A) $\frac{4}{3}\left(4\pi - \sqrt{3}\right)$ (B) $\frac{4}{3}\left(4\pi + \sqrt{3}\right)$ (C) $\frac{4}{3}\left(8\pi - \sqrt{3}\right)$ (D) $\frac{4}{3}\left(8\pi + \sqrt{3}\right)$

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115. Smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line $x + y = 2$is(A) $2(\pi - 2)$ (B) $\pi - 2$ (C) $2\pi - 1$ (D) $2(\pi + 2)$

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116. Area lying between the curves $y^2 = 4x$ and $y = 2x$ is(A) $\frac{2}{3}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{3}{4}$

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

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118. 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) $\frac{9}{2}$

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Others

1. Find the area enclosed by the curve $y = x^2$ and straight line $x + y + 2 = 0$.

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2. Find the area bounded by the curve $y^2 = 4a^2(x - 1)$ and the lines $x = 1 and y = 4a$.

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3. Find the area of region bounded by $x^2 + 16y = 0$ and its latusrectum.

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4. Find the area of region bounded by the curve $ay^2 = x^3$, the $y - a\xi s$ and the lines $y = aandy = 2a\cdot$

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5. Sketch the region bounded by $y = 2x - x^2$ and $x-$axis and find its area using integration.

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6. Find the area enclosed by the curves $3x^2 + 5y = 32 and y = |x - 2|$.

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