Calculus –2

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Find the volume of the solid generated by revolving the region about the given axis. Use the shell or washer method.

  1) The region in the first quadrant bounded by $x = 6y - y^2$ and the y-axis about the line $x = -1$

  2) The region bounded by $y = 5\sqrt{x}$, $y = 5$, and $x = 0$ about the line $y = 5$

Find the volume of the solid generated by revolving the region about the given line.

  3) The region in the second quadrant bounded above by the curve $y = 4 - x^2$, below by the x-axis, and on the right by the y-axis, about the line $x = 1$

  4) The region bounded above by the line $y = 8$, below by the curve $y = 8\cos(\pi x)$, on the left by the line $x = -0.5$, and on the right by the line $x = 0.5$, about the line $y = 8$

Use the shell method to find the volume of the solid generated by revolving the region bounded by the given curves about the given lines.

  5) $y = 25 - x^2$, $y = 25$, $x = 5$; revolve about the line $y = 25$

Find the length of the curve.

  6) $y = 4x^{3/2}$ from $x = 0$ to $x = \dfrac{5}{16}$

  7) $x = 3\sin t - 3t\cos t$, $y = 3\cos t + 3t\sin t$, $0 \le t \le \dfrac{\pi}{4}$

Find the area of the surface generated by revolving the curve about the indicated axis.

  8) $x = 3\sqrt{4 - y}$, $0 \le y \le 15/4$; y-axis

Find the area of the surface generated when the given curve is revolved about the x-axis.

  9) $y = \dfrac{x^3}{3} + \dfrac{1}{4x}$ on $\left[\dfrac{1}{2}, 1\right]$

Solve the differential equation with the initial condition.

  10) $2\dfrac{dy}{dx} - 4xy = 8x$; $y(0) = 23$

Determine if the given function y is a solution of the differential equation that follows it. Assume that C is an arbitrary constant.

  11) $y = C_1\sin 5t + C_2\cos 5t$; $y''(t) + 25y = 0$

Solve the problem.

  12) Use Newton's Law of Cooling to find the temperature in the following case. A glass of water with a temperature of 3°C is placed in a room with a temperature of 30°C. One minute later the water has warmed to 8°C. After how many minutes does the water have a temperature that is 90% of the ambient temperature?

Find the general solution of the equation. Express the solution explicitly as a function of the independent variable.

  13) $e^{3t}y'(t) = -7$

1) $\dfrac{1656}{5}\pi$

2) $\dfrac{25}{6}\pi$

3) $\dfrac{56}{3}\pi$

4) $96\pi - 256$

5) 625π

6) $\dfrac{335}{432}$

7) $\dfrac{3}{32}\pi^2$

8) $\left(\dfrac{125}{2} - 5\sqrt{10}\right)\pi$

9) $\dfrac{35\pi}{64}$

10) $y = -2 + 25e^{x^2}$

11) Yes

12) ≈ 11 min

13) $y = \dfrac{7}{3}e^{-3t} + C$