1. Find the area under the graph of $y = x + 2$ on the interval $[1, 3]$.
   (A) 2
   (B) 3
   (C) 5
   (D) 8
   (E) 15

2. Find the area between the x-axis and the graph of $y = |x|$ on the interval $[-10, 10]$.
   (A) 0
   (B) 10
   (C) 20
   (D) 50
   (E) 100

3. Find the area between the x-axis and the graph of $y = 3 - |x|$ on the interval $[0, 6]$.
   (A) 0
   (B) $\frac{9}{2}$
   (C) 9
   (D) 18
   (E) 36

4. Find the area bounded by the graph of $f(x) = \sqrt{16 - x^2}$ and the x-axis.
   (A) π
   (B) 2π
   (C) 4π
   (D) 8π
   (E) 16π

7. Find the area bounded by the graphs of $y = x^2 - 4x$ and $y = x$.
   (A) $\frac{25}{3}$
   (B) 10
   (C) 12.5
   (D) $\frac{125}{6}$
   (E) 21

8. The area enclosed by the graphs of $y = e^x$, $y = x$, the y-axis, and the line $x = 2$ is equal to
   (A) e^2
   (B) $e^2 - 1$
   (C) $e^2 + 1$
   (D) $e^2 - 3$
   (E) $e^2 - 2$

1. The base of a solid is the region enclosed by $y = \sin x$ and the x-axis on the interval $[0, \pi]$. Cross sections perpendicular to the x-axis are semicircles with diameter in the plane of the base. Write an integral that represents the volume of the solid.
   (A) $\frac{\pi}{8}\int_0^{\pi} (\sin x)^2\,dx$
   (B) $\frac{\pi}{8}\int_0^{1} (\sin x)^2\,dx$
   (C) $\frac{\pi}{4}\int_0^{\pi} (\sin x)^2\,dx$
   (D) $\frac{\pi}{8}\int_0^{\pi} \sin x\,dx$
   (E) $\frac{\pi}{2}\int_0^{\pi} (\sin x)^2\,dx$

2. The base of a solid is the region enclosed by $y = e^x$, the x-axis, the y-axis, and the line $x = \ln 3$. Cross sections perpendicular to the x-axis are squares. Write an integral that represents the volume of the solid.
   (A) $\int_0^{\ln 3} e^x\,dx$
   (B) $\int_0^{(\ln 3)^2} e^{2x}\,dx$
   (C) $\int_0^{\ln 3} e^{2x}\,dx$
   (D) $\pi\int_0^{\ln 3} e^{2x}\,dx$
   (E) $\pi\int_0^{3} e^{2x}\,dx$

5. Find the volume of the solid formed by rotating about the x-axis the region enclosed by the graph of $y = \sqrt{x} + 1$, the x-axis, the y-axis, and the line $x = 4$.
   (A) 7.667
   (B) 9.333
   (C) 22.667
   (D) 37.699
   (E) 71.209

6. Find the volume of the solid formed by rotating the region bounded by the graph of $y = \sqrt{x} + 1$, the y-axis, and the line $y = 3$ about the y-axis.
   (A) 6.40
   (B) 8.378
   (C) 20.106
   (D) 100.531
   (E) 145.77

7. Find the volume of the solid formed by rotating the region bounded by the graph of $y = \sqrt{x} + 1$, the y-axis, and the line $y = 3$ about the line $y = 5$.
   (A) 13.333
   (B) 17.657
   (C) 41.888
   (D) 92.153
   (E) 242.95

8

Which of the following integrals represents the volume of the solid obtained by rotating the region bounded by the graph of $y = -\sqrt{x}$, the x-axis, and the line $x = 4$ about the y-axis?

(A) $\pi \int_0^4 y^2\,dy$

(B) $\pi \int_0^2 y^2\,dy$

(C) $\pi \int_0^4 \left(\sqrt{x}\right)^2\,dx$

(D) $\pi \int_0^2 \left(-\sqrt{x}\right)^2\,dx$

(E) $\pi \int_0^4 (-x)\,dx$

9

The differential equation $\frac{dy}{dx} = xy + 2y$ in separable form is

(A) $\frac{dy}{xy + 2y} = dx$

(B) $dy = (xy + 2y)\,dx$

(C) $\frac{dy}{dx} - xy = 2y$

(D) $dy = (x + 2)y\,dx$

(E) $\frac{dy}{y} = (x + 2)\,dx$

4. A possible solution to $\frac{dy}{dt} = y - 5$ is

(A) $y = 5 + Ce^t$

(B) $y = Ce^t - 5$

(C) $y = 5e^t$

(D) $y^2 - 5y = t + c$

(E) $y = Ce^{-5t}$

5. The solution to the differential equation $\frac{dP}{dt} = -0.02P$ with $P(0) = 5$ is

(A) $P = 5e^{-0.02t}$

(B) $P = 5e^{-0.002t}$

(C) $P = 5 + e^{-0.02t}$

(D) $P = -0.02P^2 + c$

(E) $P = \frac{1}{5 - 0.02t}$

1. The differential equation $\frac{dy}{dx} = 2y + 50$ written in separable form is

(A) $\frac{1}{2y}\frac{dy}{dx} = 50$

(B) $\frac{dy}{y + 50} = 2dx$

(C) $dy = (2y + 50)dx$

(D) $\frac{dy}{y + 25} = 2dx$

(E) $\frac{dy}{2y} = 50dx$

2. If $y = \ln(e^{-t^2} + 10)$, then $\frac{dy}{dx} =$

(A) $-2t$

(B) $\frac{1}{e^{-t^2} + 10}$

(C) $\frac{-2te^{-t^2}}{e^{-t^2} + 10}$

(D) $\frac{-2t}{e^{-t^2} + 10}$

(E) $-2t + \frac{1}{10}$

2. The x-coordinate(s) of the point(s) of inflection of $f(x) = \frac{x}{x^2 + 1}$ is (are)

(A) 0

(B) ± 1

(C) $\pm\sqrt{3}$

(D) 0 and $\pm\sqrt{3}$

(E) no points of inflection

7. Find $\frac{dy}{dx}$ if $y = 3x(x - 2)^3$.

(A) $9(x - 2)^2$

(B) $9x(x - 2)^2$

(C) $(12x - 6)(x - 2)^2$

(D) $3(x - 2)^3$

(E) $(2x - 1)(x - 2)^2$

1. Find the equation of the line tangent to $f(x) = 2x + 2e^x$ at $x = 0$.

(A) $y = 4x + 2$

(B) $y = 2x + 2$

(C) $y = 4x$

(D) $y = 4x - 2$

(E) $y = -\frac{1}{4}x + 2$