1. The height of a tree over time can be modeled by the function $h(x) = 0.5t + \frac{2}{4t + 1}$, where h is measured in feet and t in years. What is the average height of the tree over the first 10 years?

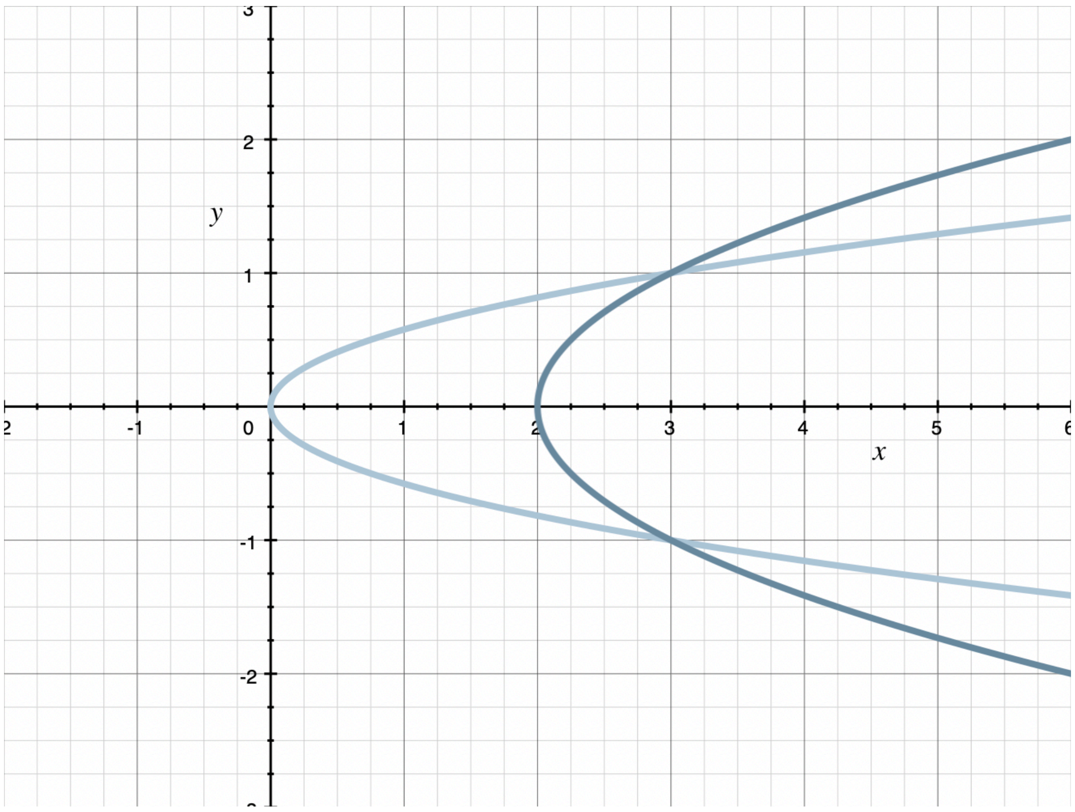
A 2.686 ft

B 6.214 ft

C 12.427 ft

D 4.598 ft

2. Find the area between the curves $x = 3y^2$ and $x = y^2 + 2$, shown in the graph below.



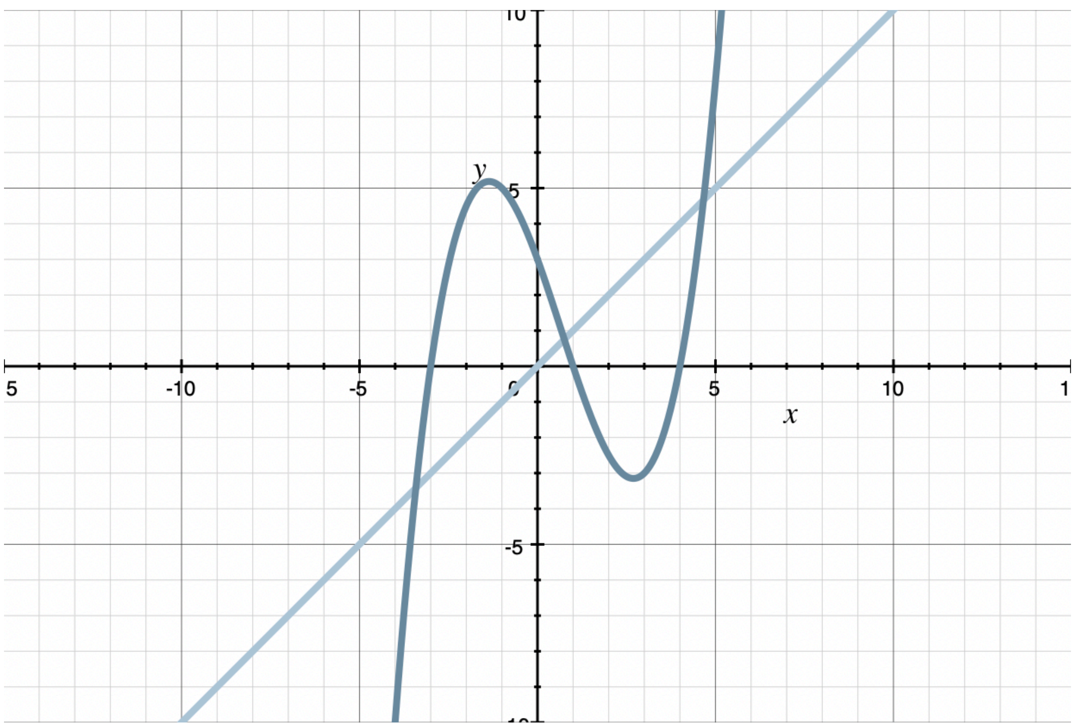
A $\frac{8}{3}$

B $\frac{4}{3}$

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

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

■ 3. Given the graph of $f(x) = x$ and $g(x) = \frac{1}{4}x^3 - \frac{1}{2}x^2 - \frac{11}{4}x + 3$ below, which intersect at $x = -3.417$, 0.752 and 4.664, which of the following integral expressions could be used to find the total area between these curves?



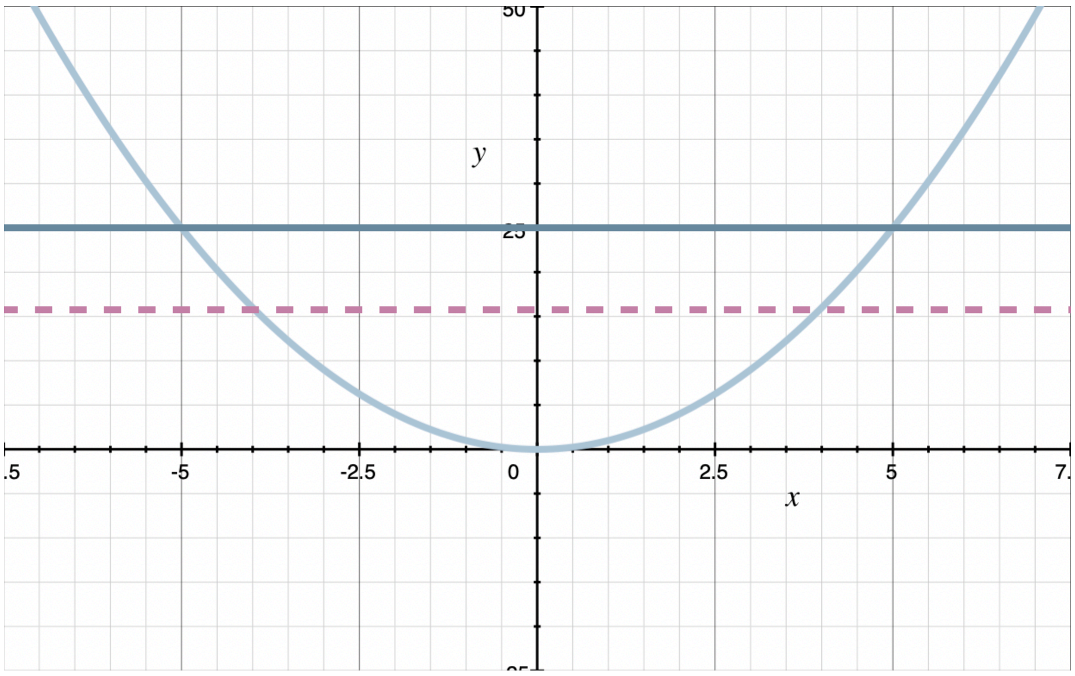
A $\displaystyle\int_{-3.417}^{4.664} f(x) - g(x)\ dx$

B $\displaystyle\int_{-3.417}^{0.752} g(x) - f(x)\ dx + \int_{0.752}^{4.664} f(x) - g(x)\ dx$

C $\displaystyle\int_{-3.417}^{4.664} |f(x) + g(x)|\ dx$

D $\displaystyle 2\int_{0.752}^{4.664} g(x) - f(x)\ dx$

■ 4. The horizontal line $y = k$ divides the area bounded by the curves $f(x) = x^2$ and $g(x) = 25$ into two equal parts. Find k.



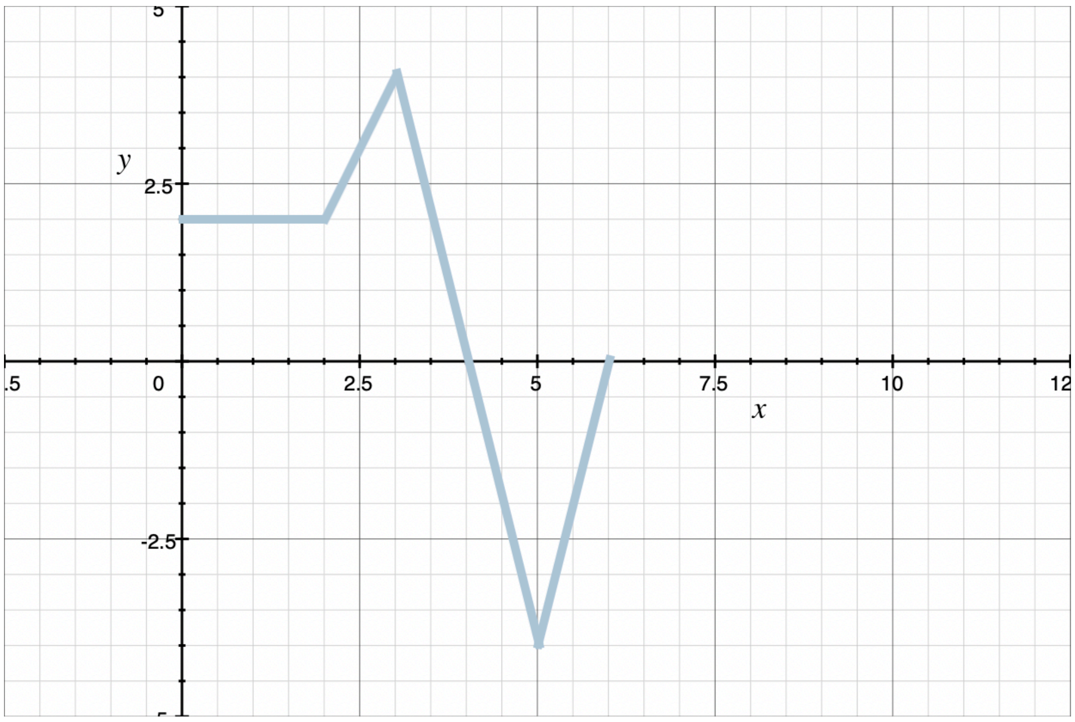
A $k = \sqrt{\frac{25\sqrt[3]{2}}{2}}$

B $k = -\frac{25\sqrt[3]{2}}{2}$

C $k = -\sqrt{\frac{25\sqrt[3]{2}}{2}}$

D $k = \frac{25\sqrt[3]{2}}{2}$

■ 5. Given that the graph of $f(x)$ below consists of line segments, what is the average value of $f(x)$ on the interval $[0,6]$?



A $\frac{5}{2}$

B $\frac{13}{2}$

C $\frac{5}{6}$

D $\frac{13}{6}$

■ 6. Given that the velocity of a particle moving along the y-axis is $v(t) = 0.3t - 1 + 2\cos t$, where $v(t)$ is measured in ft/sec, use a calculator to find the total distance travelled by the particle during its first 10 seconds of motion.

A 3.912 ft

B 0.322 ft

C 24.899 ft

D 12.746 ft

■ 7. The rate of change of the depth of a river, where depth D is measured in feet and time t is measured in days, can be modeled by

$D'(t) = (6t - t^2)\sin\left(\frac{t}{12}\right)$. Use a calculator to determine how much the depth of the water changes from day 0 to day 8.

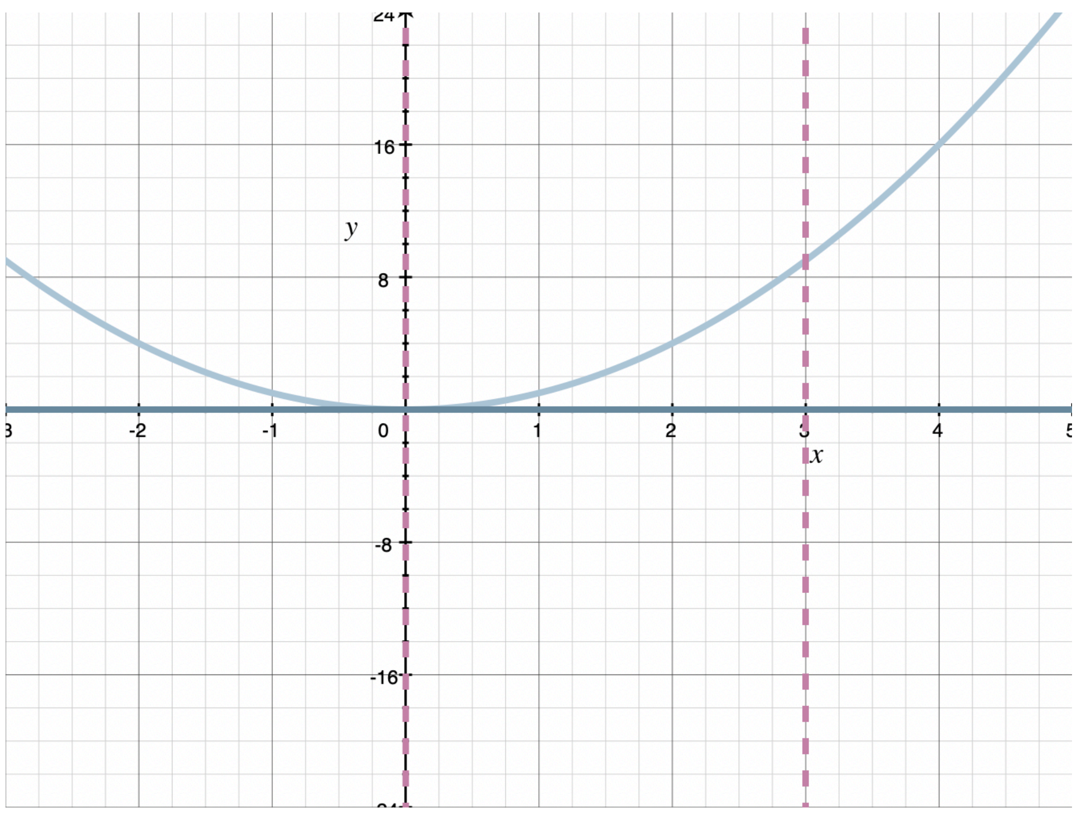
A Decreases by 9.894 ft

B Decreases by -1.237 ft

C Increases by 0.411 ft

D Increases by 17.290 ft

■ 8. Use disks to find the volume of the solid formed by rotating the region enclosed by the curves $y = x^2$, $y = 0$, $x = 0$, and $x = 3$ about the x-axis.



A $V = \frac{243}{5}\pi$ cubic units

B $V = \frac{243}{5}$ cubic units

C $V = 243\pi$ cubic units

D $V = 81\pi$ cubic units

■ 9. The region bounded by the graphs of $y = x^2 + 2$, $y = 4$, and the y-axis is revolved about the line $x = 3$. Use a calculator to ind the volume of the solid of revolution.

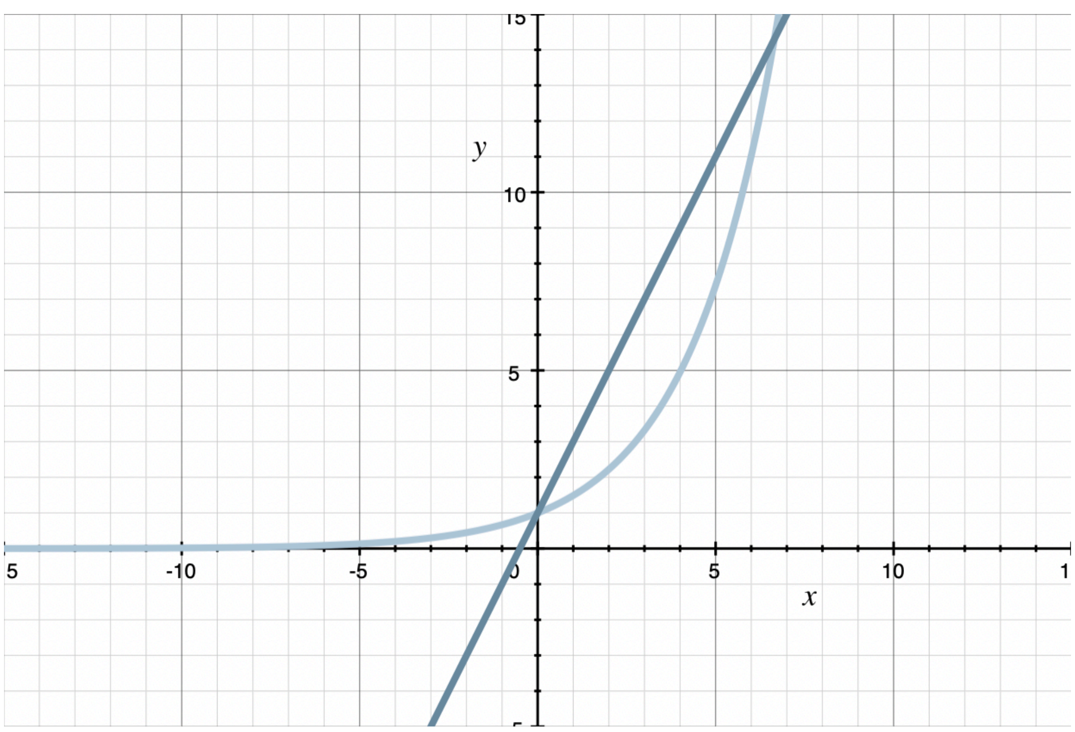
A 9.314

B 29.260

C 6.283

D 83.837

■ 10. Consider the functions $f(x) = e^{0.4x}$ and $g(x) = 2x + 1$. If a solid is constructed with the area between $f(x)$ and $g(x)$ as its base, and if cross sections of the solid perpendicular to the x-axis are semicircles, then use a calculator to find the volume of the solid.



A 22.247

B 44.496

C 91.488

D 177.982

■ 11. Consider the region bounded by the graphs of $y = x(6 - x)$ and $y = x \sin x$.

a. Use a calculator to determine the area between the curves.

b. Find the volume of the solid generated by revolving the region around the line $y = 10$.

c. Find the volume of the solid generated by revolving the region around the line $y = -5$.

d. Find the volume of a solid with known cross sections that are rectangles perpendicular to the x-axis with a height that's three times their base.

■ 12. The velocity of a particle is given by $v(t) = e^t \sin t$, where $v(t)$ is measured in feet per second.

a. Write, but do not evaluate, an integral expression that is the average velocity over the interval $[0,\pi]$.

b. What is the average acceleration of the particle over the interval $\left[\frac{\pi}{2}, \pi\right]$?

c. What would the integral expression $\int_0^{2\pi} v(t)\ dt$ represent in the context of the problem?

d. What would the integral expression $\int_0^{2\pi} |v(t)|\ dt$ represent in the context of the problem?