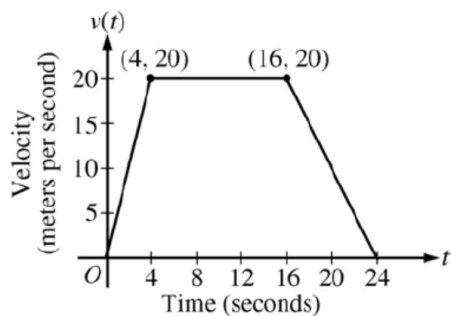


1) NO CALCULATOR



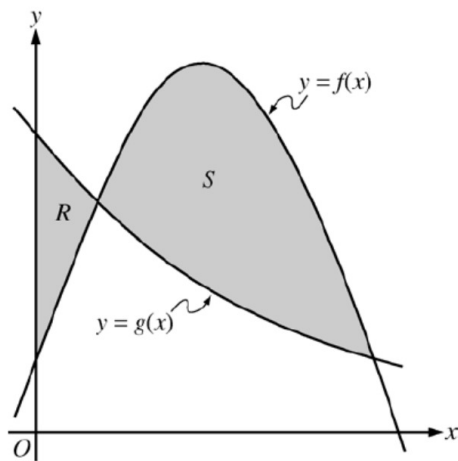
A car is traveling on a straight road. For $0 \leq t \leq 24$ seconds, the car's velocity $v(t)$, in meters per second, is modeled by the piecewise-linear function defined by the graph above.

- Find $\int_0^{24} v(t) dt$. Using correct units, explain the meaning of $\int_0^{24} v(t) dt$.
- For each of $v'(4)$ and $v'(20)$, find the value or explain why it does not exist. Indicate units of measure.
- Let $a(t)$ be the car's acceleration at time t , in meters per second per second. For $0 < t < 24$, write a piecewise-defined function for $a(t)$.
- Find the average rate of change of v over the interval $8 \leq t \leq 20$. Does the Mean Value Theorem guarantee a value of c , for $8 < c < 20$, such that $v'(c)$ is equal to this average rate of change? Why or why not?

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2) CALCULATOR ALLOWED

ONLY set up the integrals - do NOT evaluate



Let f and g be the functions given by $f(x) = \frac{1}{4} + \sin(\pi x)$ and $g(x) = 4^{-x}$. Let R be the shaded region in the first quadrant enclosed by the y -axis and the graphs of f and g , and let S be the shaded region in the first quadrant enclosed by the graphs of f and g , as shown in the figure above.

- Find the area of R .
- Find the area of S .
- Find the volume of the solid generated when S is revolved about the horizontal line $y = -1$.

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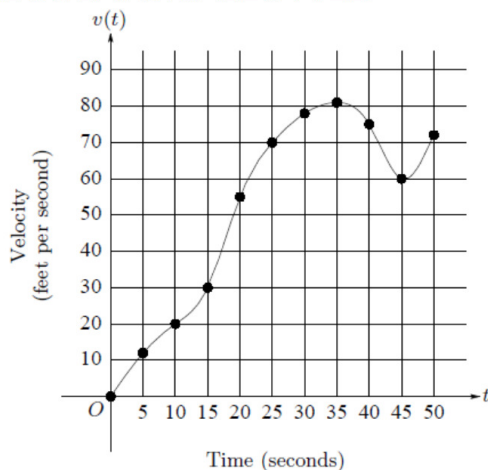
3) CALCULATOR ALLOWED

Let R be the region bounded by the x -axis, the graph of $y = \sqrt{x}$, and the line $x = 4$.

- Find the area of the region R .
- Find the value of h such that the vertical line $x = h$ divides the region R into two regions of equal area.
- Find the volume of the solid generated when R is revolved about the x -axis.
- The vertical line $x = k$ divides the region R into two regions such that when these two regions are revolved about the x -axis, they generate solids with equal volumes. Find the value of k .

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4) CALCULATOR ALLOWED



t (seconds)	$v(t)$ (feet per second)
0	0
5	12
10	20
15	30
20	55
25	70
30	78
35	81
40	75
45	60
50	72

The graph of the velocity $v(t)$, in ft/sec, of a car traveling on a straight road, for $0 \leq t \leq 50$, is shown above. A table of values for $v(t)$, at 5 second intervals of time t , is shown to the right of the graph.

- During what intervals of time is the acceleration of the car positive? Give a reason for your answer.
- Find the average acceleration of the car, in ft/sec^2 , over the interval $0 \leq t \leq 50$.
- Find one approximation for the acceleration of the car, in ft/sec^2 , at $t = 40$. Show the computations you used to arrive at your answer.
- Approximate $\int_0^{50} v(t) dt$ with a Riemann sum, using the midpoints of five subintervals of equal length. Using correct units, explain the meaning of this integral.

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