6.1 Accumulation of Change
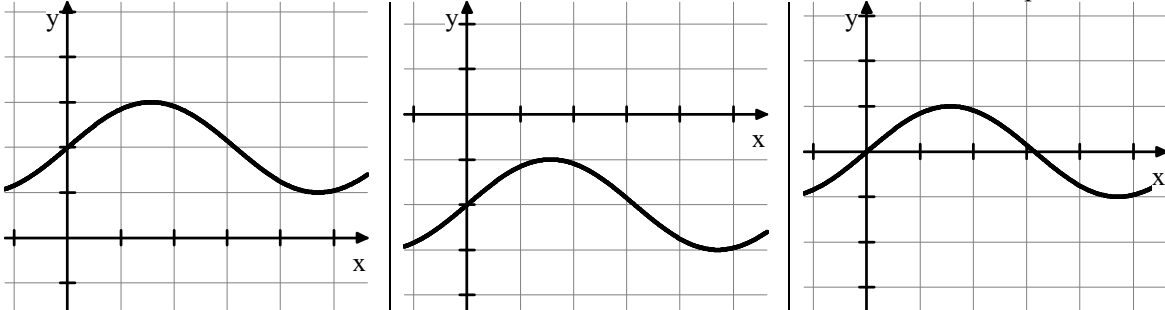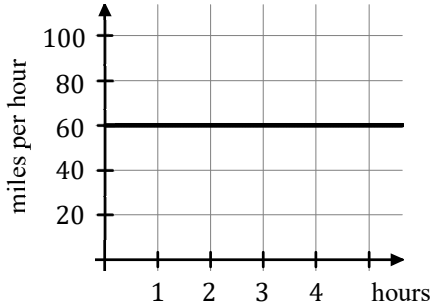
Area Under the Curve:

The region between a function and the x-axis is called the area under the curve. "Under" in this instance does not mean below. It means between the x-axis and the function. For example

Let's take a rate of change function and examine its graph. The area under the curve gives us the **accumulation of change**.

1. You are on a road trip and have your car on cruise control for 4 hours. You travel at 60 miles per hour. How far have you traveled?

Units for Area Under the Curve:

The dependent unit multiplied by the independent unit. In other words, the unit for   times the unit for   .

2. The graph below represents the rate at which water is leaking out of a tank. The units are given in the graph. How much water has leaked out of the tank after 9 minutes?
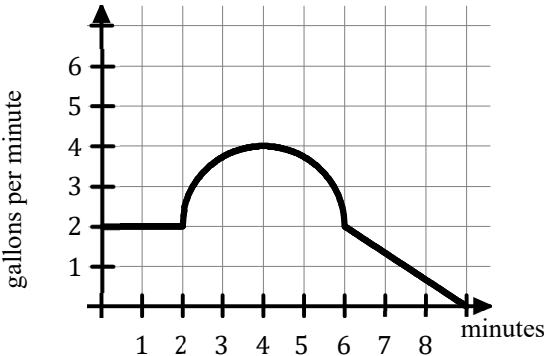
3. A particle is moving along the x-axis at a rate modeled by $r(t)$ and shown in the graph below.

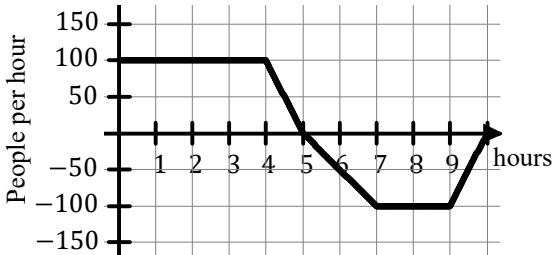cm per second

$r(t)$
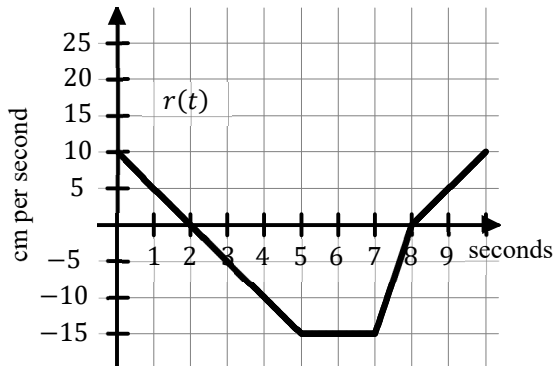
seconds

a. How far is the particle from its starting position after 10 seconds?

b. How far is the particle from its position at $t = 2$ after $t = 8$ seconds?

6.1 Accumulation of Change
Calculus

Practice

1. The graph below shows the rate of change for the number of people in a museum t hours after it opens.


People per hour

hours

a. How many people are in the museum after 5 hours?

b. How many people are in the museum after 10 hours?

2. The graph below shows the velocity of a particle moving along the x-axis, measured in meters per minute. At $t = 0$ minutes, the particle is at the origin.

meters per minute
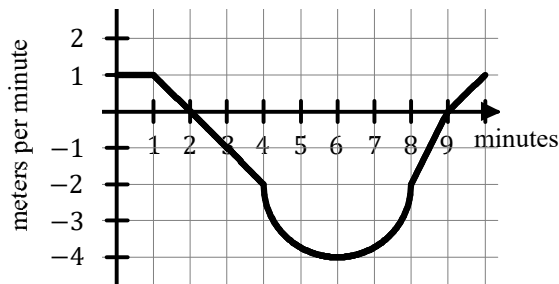
minutes

a. Where is the particle after two minutes?

b. Where is the particle after six minutes?

c. Where is the particle after ten minutes?

3. The amount of water in a small pond is changing at the rate modeled in the graph below, where the rate is measured in cubic inches per hour.
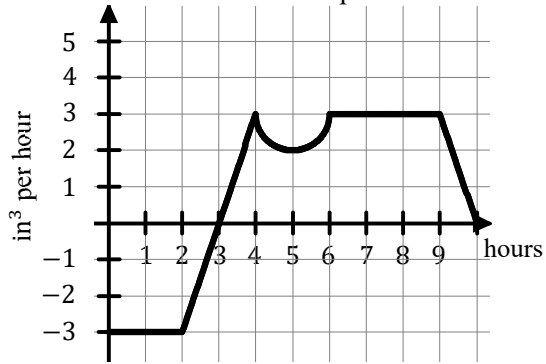
   a. How much water has been gained/lost during the first three hours?

   b. How much water has been gained/lost after 10 hours?

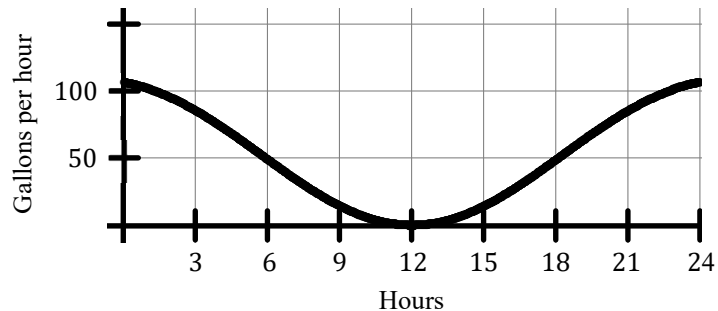| Each function listed represents a rate of change. What are the units for the area under the curve?		
4. $f(t)$ is measured in milligrams per year and t is measured in years.	5. $g(t)$ is measured in gallons per month and t is measured in months.	6. $h(t)$ is measured in feet per hour and t is measured in hours.

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Test Prep

7.

The flow of water, in gallons per hour, through a garden house on a hot summer day is given by the graph shown above. Of the following, which best approximates the total number of gallons of water that passed through the garden hose that day?

(A) 400   (B) 800   (C) 1,200   (D) 2,400