

45. **Velocity** The graph shows the velocity, in feet per second, of a car accelerating from rest. Use the graph to estimate the distance the car travels in 8 seconds.

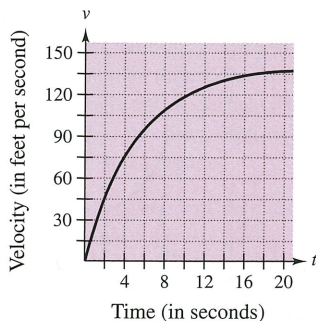


Figure for 45

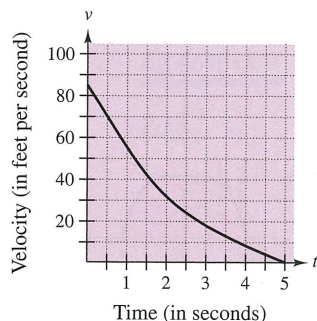


Figure for 46

46. **Velocity** The graph shows the velocity of a car as soon as the driver applies the brakes. Use the graph to estimate how far the car travels before it comes to a stop.

## Writing About Concepts

47. State the Fundamental Theorem of Calculus.

48. The graph of  $f$  is given in the figure.

(a) Evaluate  $\int_1^7 f(x) dx$ .

- (b) Determine the average value of  $f$  on the interval  $[1, 7]$ .

- (c) Determine the answers to parts (a) and (b) if the graph is translated two units upward.

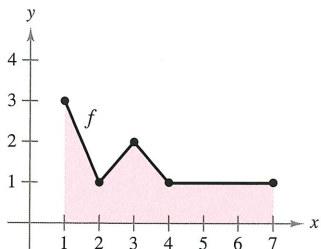


Figure for 48

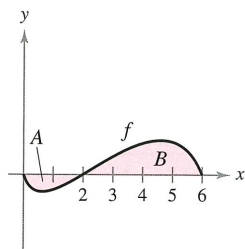


Figure for 49–54

In Exercises 49–54, use the graph of  $f$  shown in the figure. The shaded region  $A$  has an area of 1.5, and  $\int_0^6 f(x) dx = 3.5$ . Use this information to fill in the blanks.

49.  $\int_0^2 f(x) dx =$

50.  $\int_2^6 f(x) dx =$

51.  $\int_0^6 |f(x)| dx =$

52.  $\int_0^2 -2f(x) dx =$

53.  $\int_0^6 [2 + f(x)] dx =$

54. The average value of  $f$  over the interval  $[0, 6]$  is .

55. **Respiratory Cycle** The volume  $V$  in liters of air in the lungs during a five-second respiratory cycle is approximated by the model

$$V = 0.1729t + 0.1522t^2 - 0.0374t^3$$

where  $t$  is the time (in seconds). Approximate the average volume of air in the lungs during one cycle.

56. **Blood Flow** The velocity  $v$  of the flow of blood at a distance  $r$  from the central axis of an artery of radius  $R$  is

$$v = k(R^2 - r^2)$$

where  $k$  is the constant of proportionality. Find the average rate of flow of blood along a radius of the artery. (Use 0 and  $R$  as the limits of integration.)



57. **Modeling Data** A radio-controlled experimental vehicle is tested on a straight track. It starts from rest, and its velocity  $v$  (in meters per second) is recorded in the table every 10 seconds for 1 minute.

$t$	0	10	20	30	40	50	60
$v$	0	5	21	40	62	78	83

- (a) Use a graphing utility to find a model of the form

$$v = at^3 + bt^2 + ct + d$$

for the data.

- (b) Use a graphing utility to plot the data and graph the model.

- (c) Use the Fundamental Theorem of Calculus to approximate the distance traveled by the vehicle during the test.



58. **Modeling Data** A department store manager wants to estimate the number of customers that enter the store from noon until closing at 9 P.M. The table shows the number of customers  $N$  entering the store during a randomly selected minute each hour from  $t - 1$  to  $t$ , with  $t = 0$  corresponding to noon.

$t$	1	2	3	4	5	6	7	8	9
$N$	6	7	9	12	15	14	11	7	2

- (a) Draw a histogram of the data.

- (b) Estimate the total number of customers entering the store between noon and 9 P.M.

- (c) Use the *regression* feature of a graphing utility to find a model of the form

$$N(t) = at^3 + bt^2 + ct + d$$

for the data.

- (d) Use a graphing utility to plot the data and graph the model.