Use a finite approximation to estimate the area under the graph of the given function on the stated interval as instructed.

1) $f(x) = x^2$ between $x = 0$ and $x = 4$ using a right sum with two rectangles of equal width.
   A) 8   B) 38.75   C) 20   D) 40

2) $f(x) = x^2$ between $x = 2$ and $x = 6$ using a left sum with four rectangles of equal width.
   A) 69   B) 54   C) 86   D) 62

Graph the function f(x) over the given interval. Partition the interval into 4 subintervals of equal length. Then add to your sketch the rectangles associated with the Riemann sum $\sum\limits_{k=1}^{4} f(c_k)\, \Delta x_k$, using the indicated point in the kth subinterval for c_k.

3) $f(x) = 2x + 2$, $[0, 2]$, left–hand endpoint

A)

B)

C)

D)

Estimate the value of the quantity.

4) The table shows the velocity of a remote controlled race car moving along a dirt path for 8 seconds. Estimate the distance traveled by the car using 8 subintervals of length 1 with left–end point values.

Time (sec)	Velocity (in./sec)
0	0
1	10
2	21
3	17
4	27
5	30
6	32
7	12
8	5

A) 298 in.   B) 154 in.   C) 149 in.   D) 139 in.

Graph the function f(x) over the given interval. Partition the interval into 4 subintervals of equal length. Then add to your sketch the rectangles associated with the Riemann sum $\sum\limits_{k=1}^{4} f(c_k)\,\Delta x_k$ **, using the indicated point in the kth subinterval for c_k.**
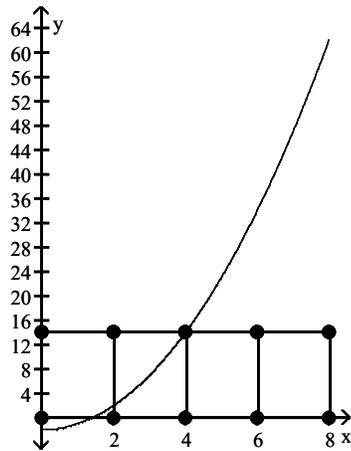
5) $f(x) = x^2 - 2$, [0, 8], midpoint

A)
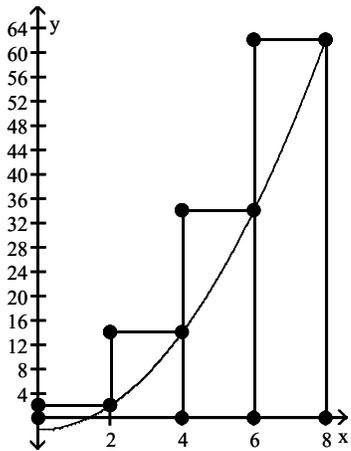
B)

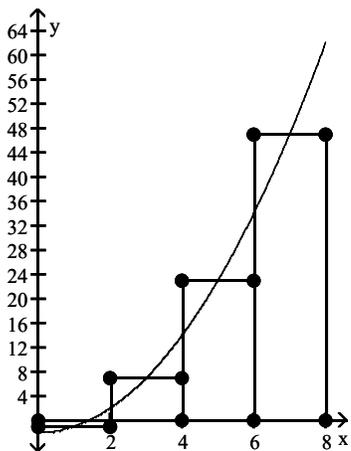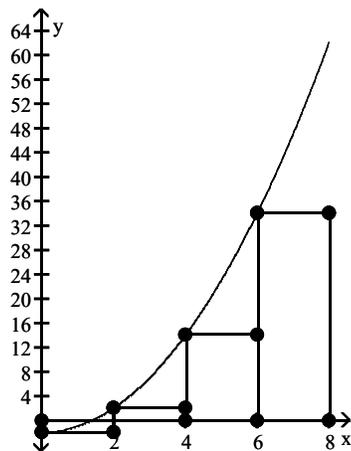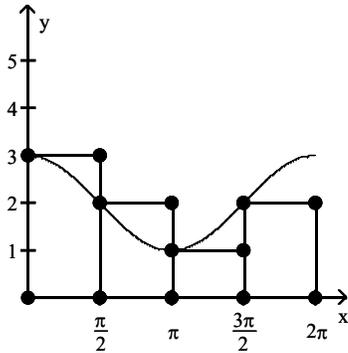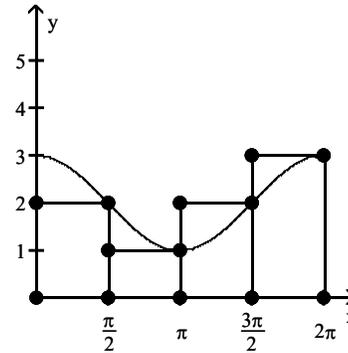C)

D)

6) $f(x) = \cos x + 2$, $[0, 2\pi]$, midpoint

A)

B)

C)
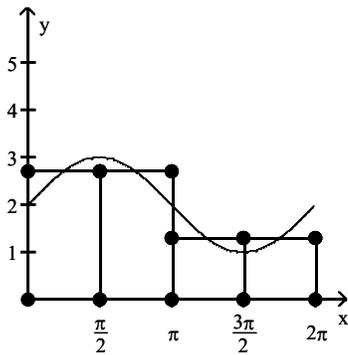
D)
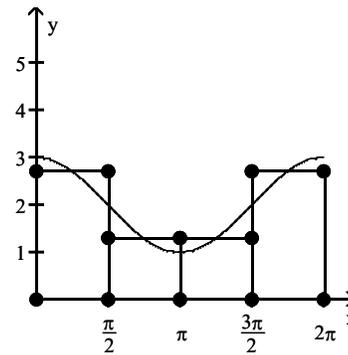
Express the sum in sigma notation.

7) $1 - 4 + 16 - 64 + 256$

A) $\displaystyle\sum_{k=-1}^{3} (-1)^{k+1} 4^k$

B) $\displaystyle\sum_{k=1}^{5} (-4)^k$

C) $\displaystyle\sum_{k=-2}^{2} (-1)^{k+1} 4^{k+1}$

D) $\displaystyle\sum_{k=0}^{4} (-1)^k 4^k$

8) $2 + 3 + 4 + 5 + 6 + 7$

A) $\displaystyle\sum_{k=2}^{5} k + 2$

B) $\displaystyle\sum_{k=0}^{5} k$

C) $\displaystyle\sum_{k=-1}^{4} (-1)^{2k} k$

D) $\displaystyle\sum_{k=0}^{5} k + 2$

9) $\dfrac{1}{2} + \dfrac{1}{4} + \dfrac{1}{8} + \dfrac{1}{16}$

A) $\displaystyle\sum_{k=0}^{4} \left(\dfrac{1}{2}\right)^{k+1}$

B) $\displaystyle\sum_{k=1}^{5} \left(\dfrac{1}{2}\right)^{k-1}$

C) $\displaystyle\sum_{k=1}^{4} \left(\dfrac{1}{2}\right)^{k-1}$

D) $\displaystyle\sum_{k=1}^{4} \left(\dfrac{1}{2}\right)^{k}$

3

Evaluate the sum.

10) $\displaystyle\sum_{k=1}^{14} k$

    A) 105   B) $\dfrac{105}{2}$ C) 14   D) 210

11) $\displaystyle\sum_{k=1}^{8} k^3$

    A) 1296   B) 648   C) 204   D) 512

Graph the integrand and use geometry to evaluate the integral.

12) $\displaystyle\int_{-1}^{6} 6\,dx$

    A) 21   B) 7   C) 42   D) 30

13) $\displaystyle\int_{17}^{21} x\,dx$

    A) 19   B) 76   C) 38   D) 152

14) $\displaystyle\int_{-1}^{5} |x|\,dx$

    A) 13   B) 26   C) 6   D) 12

15) $\displaystyle\int_{-4}^{4} \sqrt{16 - x^2}\,dx$

    A) 4π B) 16   C) 16π D) 8π

Evaluate the integral.

16) $\displaystyle\int_{0}^{9} 5\sqrt{x}\,dx$

    A) 135   B) 90   C) $\dfrac{405}{2}$ D) $\dfrac{45}{2}$

17) $\displaystyle\int_{0}^{4} (x+3)^3\,dx$

    A) 580   B) $\dfrac{2401}{4}$ C) 120   D) 2320

18) $\displaystyle\int_{1}^{4} \frac{t^2 + 1}{\sqrt{t}}\, dt$

    A) $\dfrac{92}{5}$ B) $\dfrac{72}{5}$ C) 32   D) $\dfrac{77}{5}$

19) $\displaystyle\int_{0}^{\pi/2} 22 \sin x\, dx$

    A) 1   B) 22   C) –22   D) 0

20) $\displaystyle\int_{-\pi/4}^{3\pi/4} 4 \sec\theta \tan\theta\, d\theta$

    A) $-8\sqrt{2}$ B) 0   C) $-4\sqrt{2}$ D) $4\sqrt{2}$

Find the integral.

21) $\displaystyle\int 8e^{4y}\, dy$

    A) $4e^{4y} + C$ B) $2e^{4y} + C$ C) $\dfrac{1}{4}e^{4y} + C$ D) $\dfrac{1}{2}e^{4y} + C$

22) $\displaystyle\int 13e^{-0.1x}\, dx$

    A) $-1.3e^{-0.1x} + C$ B) $-130e^{-0.1x} + C$ C) $13e^{-0.1x} + C$ D) $\dfrac{13e^{-0.1x + 1}}{-0.1x + 1} + C$

23) $\displaystyle\int (t^3 + e^{5t})\, dt$

    A) $\dfrac{t^2}{2} + 5e^{5t} + C$ B) $\dfrac{t^4}{4} + e^{5t} + C$ C) $\dfrac{t^4}{4} + \dfrac{e^{5t}}{5} + C$ D) $\dfrac{t^4}{4} + \dfrac{e^{6t}}{6} + C$

24) $\displaystyle\int 7^{3x}\, dx$

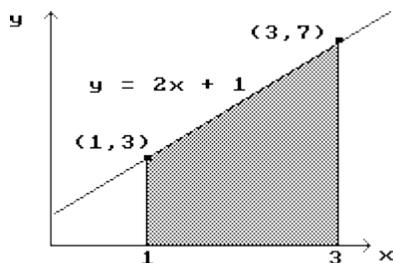   A) $\dfrac{7^{3x}}{3} + C$ B) $\dfrac{7^{3x}}{3 \ln 7} + C$ C) $\dfrac{7^{3x}}{\ln 7} + C$ D) $\dfrac{7^{4x}}{4} + C$
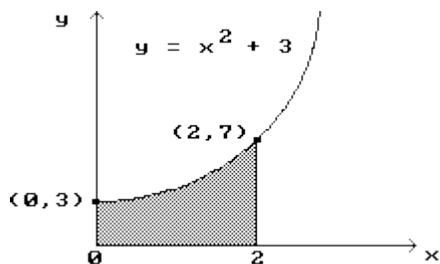
Find the area of the shaded region.

25)

    A) 5   B) 7.5   C) 12.5   D) 10

26)

y = x² + 3, with points (2,7), (0,3), shaded region from 0 to 2.

A) $\dfrac{23}{3}$ B) $\dfrac{22}{3}$ C) $\dfrac{26}{3}$ D) $\dfrac{25}{3}$

Find the total area of the region between the curve and the x–axis.

27) $y = 2x + 7; \ 1 \le x \le 5$

A) 26   B) 9   C) 18   D) 52

28) $y = x^2 - 6x + 9; \ 2 \le x \le 4$

A) $\dfrac{7}{3}$ B) $\dfrac{2}{3}$ C) $\dfrac{4}{3}$ D) $\dfrac{1}{3}$

29) $y = \dfrac{3}{x^3}; \ 1 \le x \le 3$

A) 3   B) $\dfrac{4}{3}$ C) $\dfrac{1}{3}$ D) $\dfrac{1}{2}$

Find the derivative.

30) $\dfrac{d}{dx} \displaystyle\int_{1}^{\sqrt{x}} 18t^7 \, dt$

A) $\dfrac{9}{4}x^5 - \dfrac{9}{4}$ B) $9x^3$ C) $12x^5$ D) $18x^{7/2}$

31) $\dfrac{d}{dx} \displaystyle\int_{0}^{x^3} \sin t \, dt$

A) $3x^2 \sin(x^3)$ B) $-\cos(x^3) - 1$ C) $\sin(x^3)$ D) $\dfrac{1}{4}x^4 \sin(x^3)$

Use symmetry to evaluate the integral.

32) $\displaystyle\int_{-\pi/2}^{\pi/2} \cos^5 8x \, dx$

A) $\dfrac{1}{4}$ B) 0   C) $-\dfrac{2}{15}$ D) $\dfrac{1}{15}$

Find the average value of the function over the given interval.

33) $f(x) = 6x$ on $[9, 11]$

A) 30   B) 120   C) 240   D) 60

6

34) $y = x^2 - 5x + 2$; $[0, 5]$

    A) 2   B) $-\dfrac{17}{4}$ C) $\dfrac{35}{6}$ D) $-\dfrac{13}{6}$

Find the point(s) at which the given function equals its average value on the given interval.

35) $f(x) = \sqrt{x + 1}$; $[0, 8]$

    A) $\dfrac{66}{19}$ B) $\dfrac{133}{36}$ C) $\dfrac{137}{36}$ D) $\dfrac{133}{26}$

36) $f(x) = 4 - x^2$; $[-5, 4]$

    A) $\pm\sqrt{7}$ B) $\sqrt{5}$ C) ± 3 D) $\pm\sqrt{6}$

37) $f(x) = 4 - x^2$; $[-6, 3]$

    A) ± 3 B) ± 2 C) $\sqrt{10}$ D) $\pm\sqrt{7}$

Evaluate the integral using the given substitution.

38) $\displaystyle\int x \cos(2x^2)\, dx$, $u = 2x^2$

    A) $\dfrac{1}{4}\sin(2x^2) + C$ B) $\dfrac{x^2}{2}\sin(2x^2) + C$ C) $\dfrac{1}{u}\sin(u) + C$ D) $\sin(2x^2) + C$

39) $\displaystyle\int\left(4 - \sin\dfrac{t}{2}\right)^2 \cos\dfrac{t}{2}\, dt$, $u = 4 - \sin\dfrac{t}{2}$

    A) $\dfrac{2}{3}\left(4 - \cos\dfrac{t}{2}\right)^3 + C$ B) $-\dfrac{2}{3}\left(4 - \sin\dfrac{t}{2}\right)^3 + C$

    C) $2\left(4 - \sin\dfrac{t}{2}\right)^3 + C$ D) $\dfrac{1}{3}\left(4 - \sin\dfrac{t}{2}\right)^3 \sin\dfrac{t}{2} + C$

Evaluate the integral.

40) $\displaystyle\int x^3(x^4 - 5)^4\, dx$

    A) $\dfrac{\left(x^4 - 5\right)^5}{4} + C$ B) $\dfrac{\left(x^4 - 5\right)^5}{20} + C$ C) $\left(x^4 - 5\right)^5 + C$ D) $\dfrac{\left(x^4 - 5\right)^3}{12} + C$

Use the substitution formula to evaluate the integral.

41) $\displaystyle\int_0^1 \sqrt{x + 16}\, dx$

    A) $\dfrac{34}{3}\sqrt{17}$ B) $17\sqrt{17} - 64$ C) $\dfrac{51}{2}\sqrt{17} - \dfrac{51}{2}$ D) $\dfrac{34}{3}\sqrt{17} - \dfrac{128}{3}$

42) $\displaystyle\int_1^4 \dfrac{9 - \sqrt{x}}{\sqrt{x}}\, dx$

    A) 30   B) 15   C) $\dfrac{15}{2}$ D) $-\dfrac{15}{2}$

Evaluate the integral.

43) $\int 3x^2 \sqrt[4]{9 + 3x^3} \, dx$

A) $3\left(9 + 3x^3\right)^{5/4} + C$

B) $\frac{4}{15}\left(9 + 3x^3\right)^{5/4} + C$

C) $\frac{12}{5}\left(9 + 3x^3\right)^{5/4} + C$

D) $-2\left(9 + 3x^3\right)^{-3/4} + C$

Evaluate the integral using the given substitution.

44) $\int 12(4x - 3)^{-5} \, dx, \quad u = 4x - 3$

A) $-\frac{3}{4}(4x - 3)^{-4} + C$ B) $(4x - 3)^{-4} + C$ C) $-\frac{3}{2}(4x - 3)^{-4} + C$ D) $-\frac{1}{2}(4x - 3)^{-6} + C$

45) $\int x^4(x^5 - 9)^3 \, dx, \quad u = x^5 - 9$

A) $\frac{1}{20}x^{20} - 9 + C$ B) $\frac{1}{4}(x^5 - 9)^4 + C$ C) $\frac{1}{10}(x^5 - 9)^2 + C$ D) $\frac{1}{20}(x^5 - 9)^4 + C$

Evaluate the integral.

46) $\int \frac{x \, dx}{(7x^2 + 3)^5}$

A) $-\frac{1}{56}(7x^2 + 3)^{-4} + C$

B) $-\frac{7}{3}(7x^2 + 3)^{-4} + C$

C) $-\frac{1}{14}(7x^2 + 3)^{-6} + C$

D) $-\frac{7}{3}(7x^2 + 3)^{-6} + C$

Find the area of the given region.

47) Find the area of the region between the curve $y = 2x/(1 + x^2)$ and the interval $-2 \le x \le 2$ of the x-axis.

A) $2 \ln 5$ B) $2 e^5$ C) $\ln 5$ D) 0

Provide an appropriate response.

48) Find f(x) if $f'(x) = \frac{7}{x^4}$ and $f(1) = 4$.

A) $f(x) = -\frac{7}{3}x^{-3} + \frac{19}{3}$ B) $-28x^{-5} + 32$ C) $-\frac{7}{3}x^{-3} - 3$ D) $-28x^{-5} - 3$

Solve the problem.

49) An rock's acceleration at time t is given by $a(t) = 16t$, and its initial velocity is 35. Find the velocity function v(t).

A) $v(t) = 8t^2 + 35$ B) $v(t) = 35t^2 + 16$ C) $v(t) = 8t^2 + 35t$ D) $v(t) = 16t^2 + 35$

50) The rate of expenditure for maintenance of a particular machine is given by $M'(x) = 12x\sqrt{x^2 + 5}$, where x is time measured in years. Total maintenance costs through the second year are $105. Find the total maintenance function.

A) $M(x) = 12(x^2 + 5)^{3/2} - 3$

B) $M(x) = 4(x^2 + 5)^{3/2} - 3$

C) $M(x) = 12(x^2 + 5)^{3/2} - 93$

D) $M(x) = 4(x^2 + 5)^{3/2} - 93$