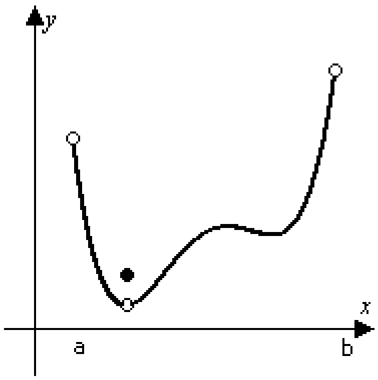
Exam

Name________________________________

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine from the graph whether the function has any absolute extreme values on the interval [a, b].



1) 1) ________

A) Absolute minimum and absolute maximum.
B) Absolute maximum only.
C) No absolute extrema.
D) Absolute minimum only.

Determine all critical points for the function.

2) $y = 2x^2 - 64\sqrt{x}$ 2) ________

A) $x = 0$ and $x = 4$
B) $x = 4$
C) $x = 0$
D) $x = 0$, $x = 4$, and $x = -4$

Find the absolute extreme values of the function on the interval.

3) $g(x) = 7 - 5x^2$, $-3 \le x \le 5$ 3) ________

A) absolute maximum is 35 at $x = 0$; absolute minimum is -38 at $x = -3$
B) absolute maximum is 14 at $x = 0$; absolute minimum is -38 at $x = 5$
C) absolute maximum is 5 at $x = 0$; absolute minimum is -132 at $x = 5$
D) absolute maximum is 7 at $x = 0$; absolute minimum is -118 at $x = 5$

4) $h(x) = \frac{1}{2}x + 2$, $-3 \le x \le 3$ 4) ________

A) absolute maximum is $\frac{7}{2}$ at $x = 3$; absolute minimum is $\frac{1}{2}$ at $x = -3$

B) absolute maximum is $-\frac{1}{2}$ at $x = -3$; absolute minimum is -3 at $x = 3$

C) absolute maximum is $-\frac{1}{2}$ at $x = 3$; absolute minimum is $\frac{1}{2}$ at $x = -3$

D) absolute maximum is $-\frac{1}{2}$ at $x = -3$; absolute minimum is $\frac{1}{2}$ at $x = 3$

Find the absolute extreme values of the function on the interval.

5) $f(x) = e^x - x, -5 \le x \le 2$ 5) ________

A) absolute minimum value is 1 at $x = 0$; absolute maximum value is $e^2 - 2$ at $x = 2$

B) absolute minimum value is $e^{-5} + 5$ at $x = -5$; absolute maximum value is $e^2 - 2$ at $x = 2$

C) absolute minimum value is 1 at $x = 0$; absolute maximum value is $e^{-5} + 5$ at $x = -5$

D) absolute minimum value is 1 at $x = 0$; no maximum value

6) $f(x) = \ln(x + 2) + \frac{1}{x}, 1 \le x \le 5$ 6) ________

A) absolute minimum value is $\ln 4 + \frac{1}{2}$ at $x = 2$; absolute maximum value is $\ln 7 + \frac{1}{5}$ at $x = 5$

B) absolute minimum value is -1 at $x = -1$; absolute maximum value is $\ln 7 + \frac{1}{5}$ at $x = 5$

C) absolute minimum value is $\ln 3 + 1$ at $x = 1$; absolute maximum value is $\ln 7 + \frac{1}{5}$ at $x = 5$

D) absolute minimum value is $\ln 4 + \frac{1}{2}$ at $x = 2$; absolute maximum value is $\ln 3 + 1$ at $x = 1$

Find the extreme values of the function and where they occur.

7) $y = \frac{3x}{x^2 + 1}$ 7) ________

A) Absolute minimum value is 0 at $x = 0$.

B) Absolute maximum value is 0 at $x = 0$.

C) Absolute minimum value is $-\frac{3}{2}$ at $x = -1$. Absolute maximum value is $\frac{3}{2}$ at $x = 1$.

D) Absolute minimum value is 0 at $x = 1$. Absolute maximum value is 0 at $x = -1$.

8) $y = (x - 1)^{2/3}$ 8) ________

A) Absolute maximum value is 0 at $x = -1$.

B) Absolute minimum value is 0 at $x = 1$.

C) Absolute minimum value is 0 at $x = -1$.

D) There are no definable extrema.

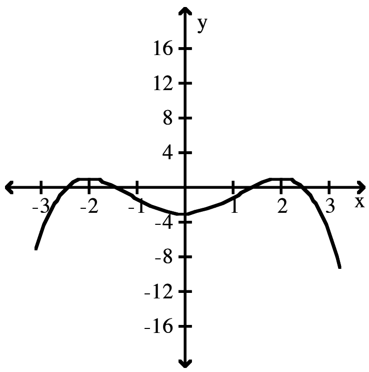
Solve the problem.

9) Select an appropriate graph of a twice-differentiable function $y = f(x)$ that passes through the points $(-\sqrt{2}, 1)$, $\left(-\frac{\sqrt{6}}{3}, \frac{5}{9}\right)$, $(0,0)$, $\left(\frac{\sqrt{6}}{3}, \frac{5}{9}\right)$ and $(\sqrt{2}, 1)$, and whose first two derivatives have the following sign patterns. 9) ________

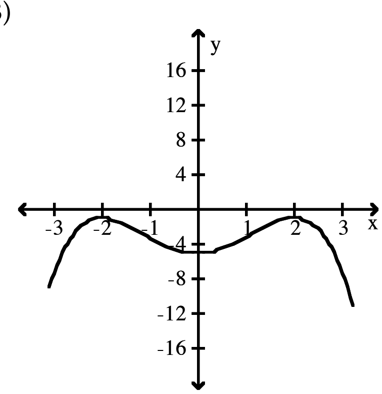
y' : $+$ $\quad -\sqrt{2} \quad$ $-$ $\quad 0 \quad$ $+$ $\quad \sqrt{2} \quad$ $-$

y'' : $-$ $\quad -\frac{\sqrt{6}}{3} \quad$ $+$ $\quad \frac{\sqrt{6}}{3} \quad$ $-$

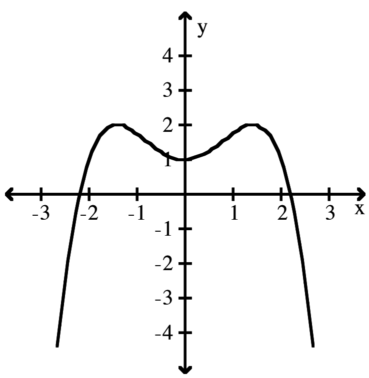
A)



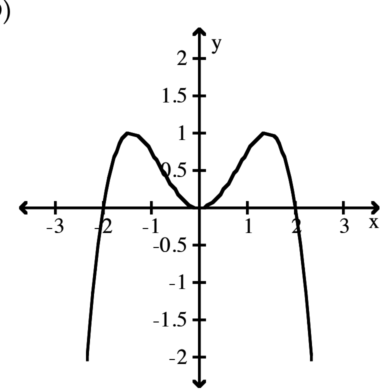
B)



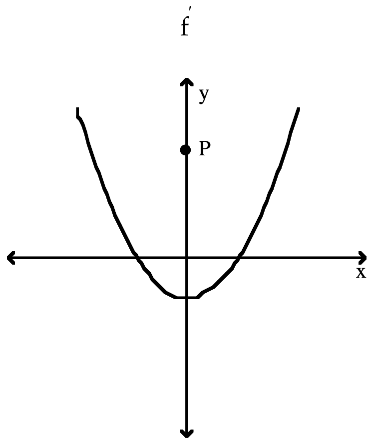
C)



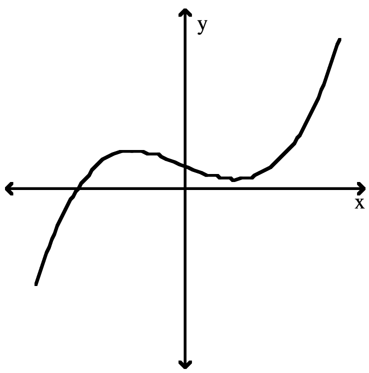
D)



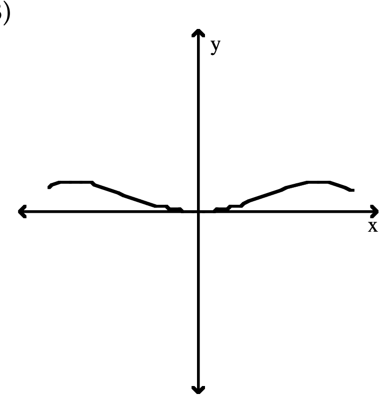
10) The graph below shows the first derivative of a function y = f(x). Select a possible graph for f 10) _______



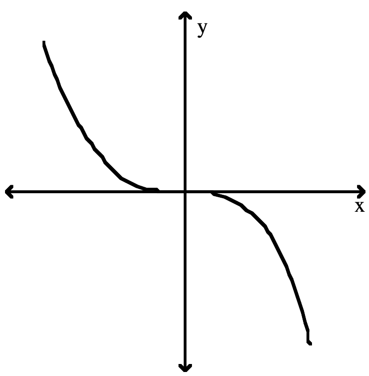
A)



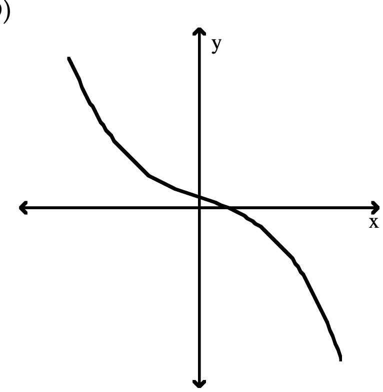
B)



C)

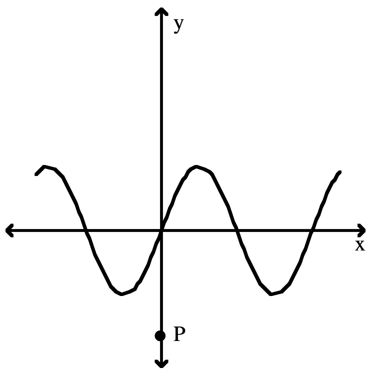


D)

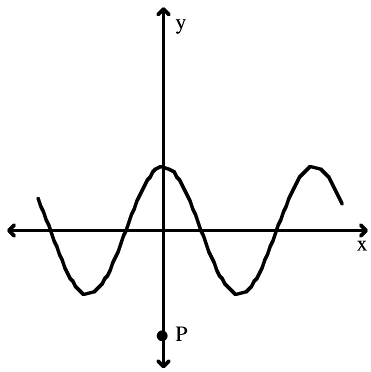


11) The graphs below show the first and second derivatives of a function y = f(x). Select a possible graph for f. 11) _______

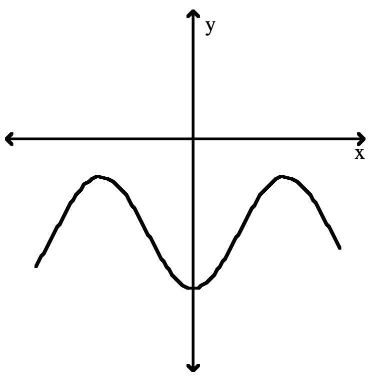
f'



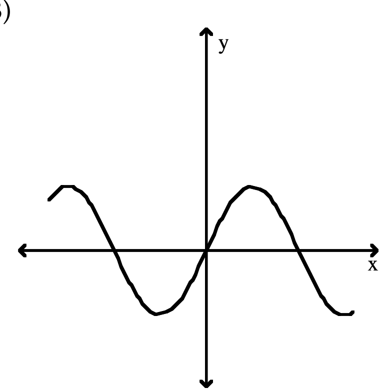
f''



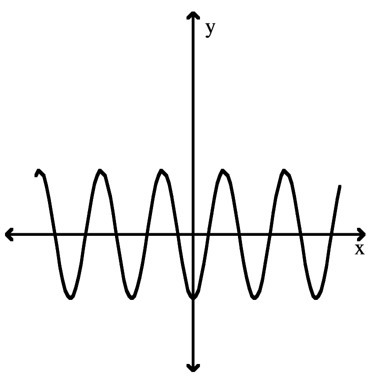
A)



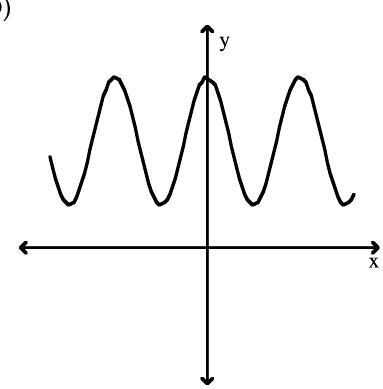
B)



C)



D)



E) None of the above.

Find the largest open interval where the function is changing as requested.

12) Decreasing $f(x) = x^3 - 4x$ 12) _______

A) $\left(-\frac{2\sqrt{3}}{3}, \frac{2\sqrt{3}}{3}\right)$

B) $(-\infty, \infty)$

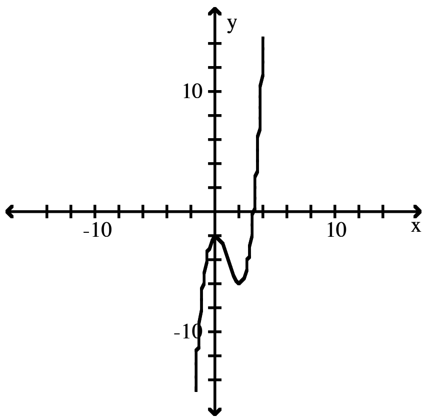
C) $\left(-\infty, -\frac{2\sqrt{3}}{3}\right)$

D) $\left(\frac{2\sqrt{3}}{3}, \infty\right)$

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.

13)

13) _______



A) Local minimum at $x = 2$; local maximum at $x = 0$; concave up on $(1, \infty)$; concave down on $(-\infty, 1)$

B) Local minimum at $x = 0$; local maximum at $x = 2$; concave down on $(1, \infty)$; concave up on $(-\infty, 1)$

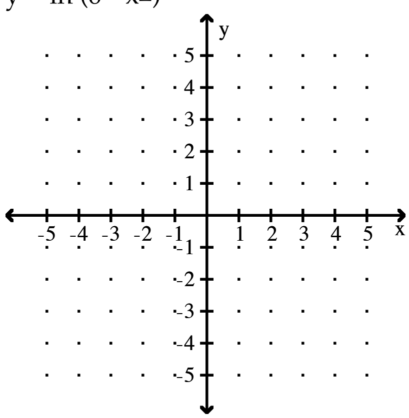
C) Local minimum at $x = 2$; local maximum at $x = 0$; concave down on $(1, \infty)$; concave up on $(-\infty, 1)$

D) Local minimum at $x = 0$; local maximum at $x = 2$; concave up on $(1, \infty)$; concave down on $(-\infty, 1)$

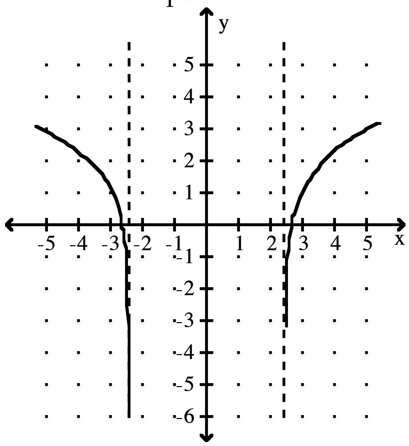
Sketch the graph and show all local extrema and inflection points.

14) $y = \ln(6 - x^2)$

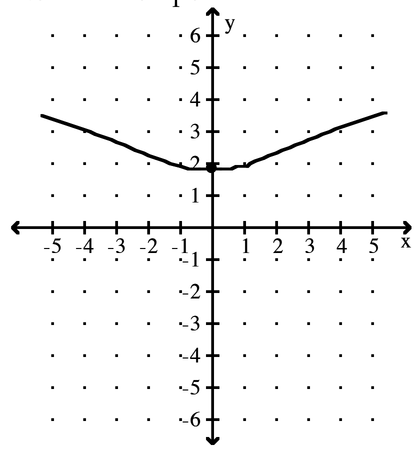
14) _______



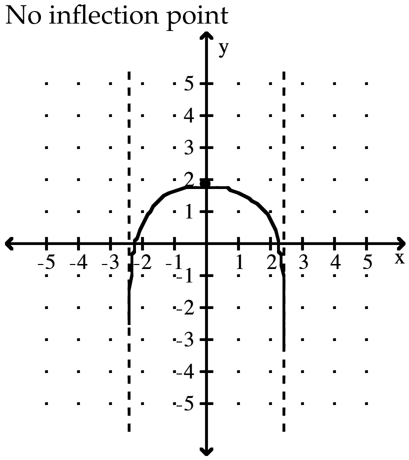
A) No extrema
No inflection point



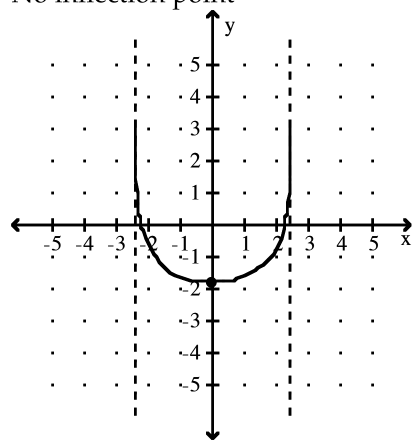
B) Local minimum (0, ln 6)
No inflection point



C) Local maximum (0, ln 6)
No inflection point

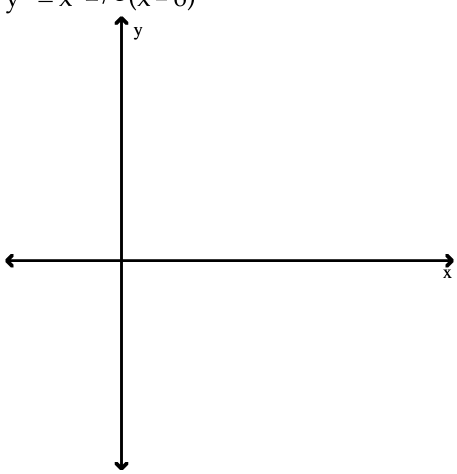


D) Local minimum (0, –ln 6)
No inflection point

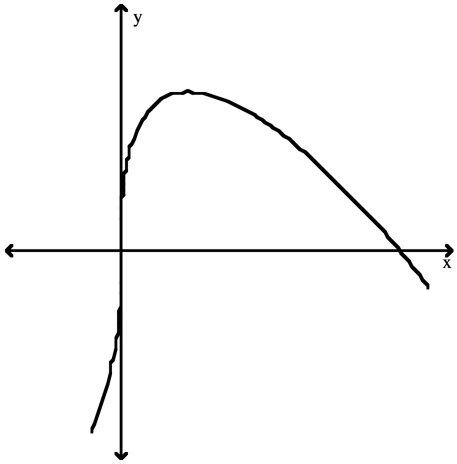


For the given expression y', find y" and sketch the general shape of the graph of y = f(x).

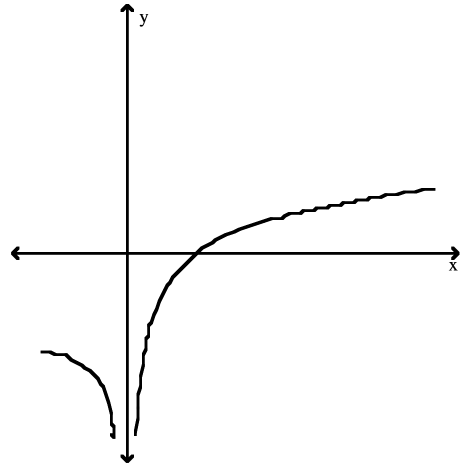
15) $y' = x^{-2/3}(x - 6)$ 15) _______



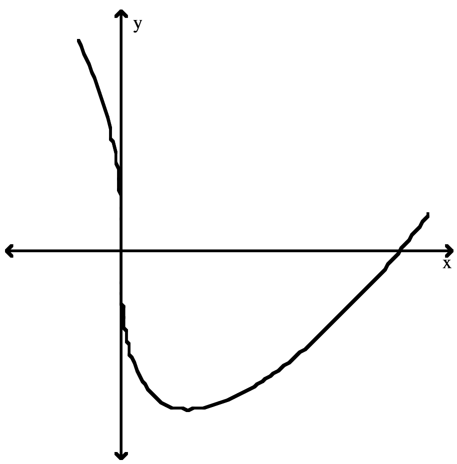
A)



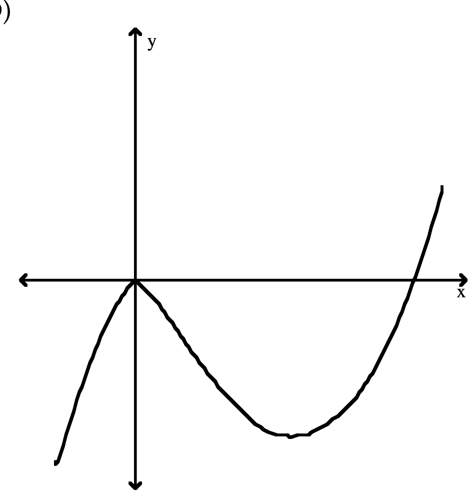
B)



C)



D)

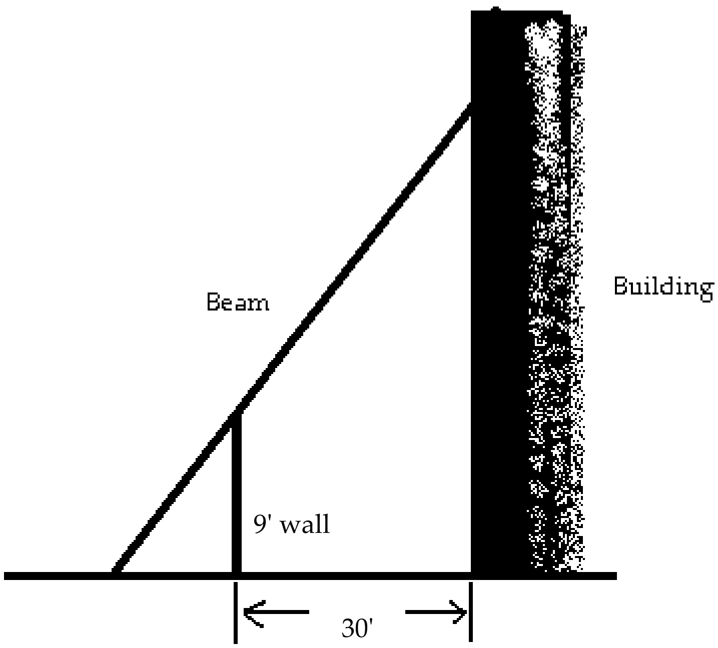


Solve the problem.

16) A long strip of sheet metal 12 inches wide is to be made into a small trough by turning up two sides at right angles to the base. If the trough is to have maximum capacity, how many inches should be turned up on each side? 16) ______

A) 4 in. on one side, 5 in. on the other
B) 6 in.
C) 3 in.
D) 4 in.

17) The 9 ft wall shown here stands 30 feet from the building. Find the length of the shortest straight beam that will reach to the side of the building from the ground outside the wall. 17) _______



A) 51.3 ft B) 53.3 ft C) 52.3 ft D) 39 ft

18) Suppose a business can sell x gadgets for $p = 250 - 0.01x$ dollars apiece, and it costs the business $c(x) = 1000 + 25x$ dollars to produce the x gadgets. Determine the production level and cost per gadget required to maximize profit. 18) _______

A) 111 gadgets at $248.89 each B) 10,000 gadgets at $150.00 each
C) 11,250 gadgets at $137.50 each D) 13,750 gadgets at $112.50 each

Use l'Hopital's Rule to evaluate the limit.

19) $\lim\limits_{x \to 0} \dfrac{\cos 5x - 1}{x^2}$ 19) _______

A) $\frac{5}{2}$ B) $-\frac{25}{2}$ C) 0 D) $\frac{25}{2}$

Find the limit.

20) $\lim\limits_{x \to \infty} (\ln x)^{5/x}$ 20) _______

A) 0 B) 5 C) e^5 D) 1

Use l'Hopital's Rule to evaluate the limit.

21) $\lim\limits_{x \to \infty} \left(\sqrt{x^2 + 3x} - x\right)$ 21) _______

A) 3 B) 0 C) $\frac{3}{2}$ D) $-\frac{3}{2}$

L'Hopital's rule does not help with the given limit. Find the limit some other way.

22) $\lim\limits_{x \to 0} \dfrac{\sec x}{\csc x}$ 22) _______

A) ∞ B) -1 C) 0 D) 1

Find an antiderivative of the given function.

23) $8 \cos 9x$ 23) _______

A) $8 \sin 9x$ B) $\sin 9x$ C) $-72 \sin 9x$ D) $\dfrac{8}{9} \sin 9x$

Find the most general antiderivative.

24) $\displaystyle\int \frac{\sec\theta}{\sec\theta - \cos\theta}\, d\theta$ 24) _______

A) $-\cot\theta + C$ B) $\cos^2\theta + C$ C) $\cot\theta + C$ D) $\theta + \tan\theta + C$

25) $\displaystyle\int \left(\frac{9}{x^2+1} - \frac{8}{x}\right) dx$ 25) _______

A) $9 \tan^{-1} x - \ln |x| + C$ B) $9 \tan^{-1} x + 8 \ln |x| + C$

C) $9 \tan^{-1} x - 8 \ln |x| + C$ D) $\dfrac{\tan^{-1} x}{9} - \dfrac{\ln |x|}{8} + C$

Solve the initial value problem.

26) $\dfrac{d^3y}{dx^3} = 7;\ y''(0) = -1,\ y'(0) = 6,\ y(0) = 5$ 26) _______

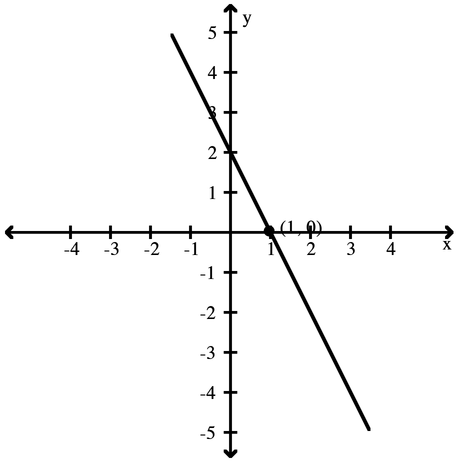
A) $y = \dfrac{7}{6}x^3 + \dfrac{1}{2}x^2 + 6$ B) $y = 5$

C) $y = \dfrac{7}{3}x^3 - \dfrac{1}{2}x^2 + 6x + 5$ D) $y = \dfrac{7}{6}x^3 - \dfrac{1}{2}x^2 + 6x + 5$

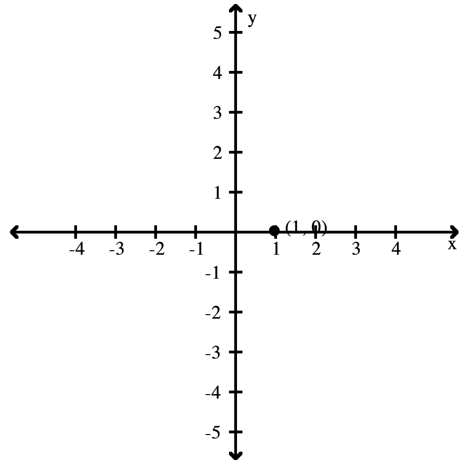
Which of the graphs shows the solution of the given initial value problem?

27) $\dfrac{dy}{dx} = -4x$, $y = 0$ when $x = 1$ 27) _______

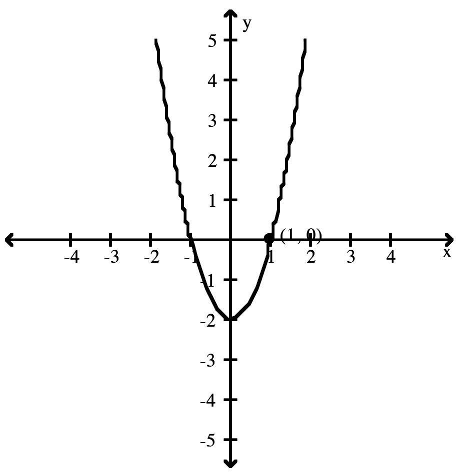
A)



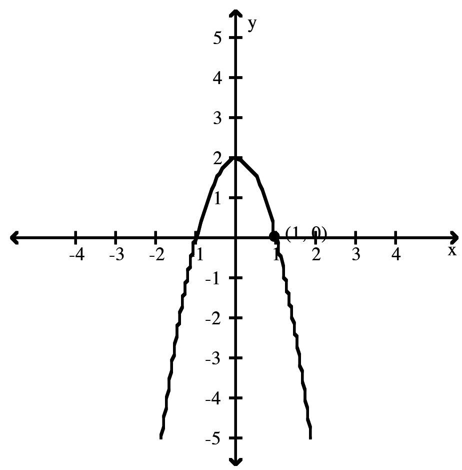
B)



C)



D)



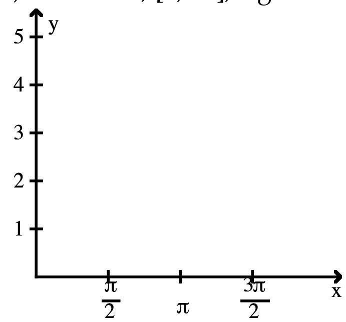
Solve the problem.

28) An object is dropped from 12 ft above the surface of the moon. How long will it take the object to hit the surface of the moon if $d^2s/dt^2 = -5.2$ ft/sec^2? 28) _______

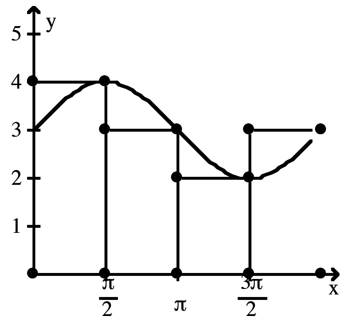
A) 2.15 sec B) 1.15 sec C) 1.52 sec D) 4.62 sec

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 $\sum_{k=1}^{4} f(c_k)\,\Delta x_k$, using the indicated point in the kth subinterval for c_k.

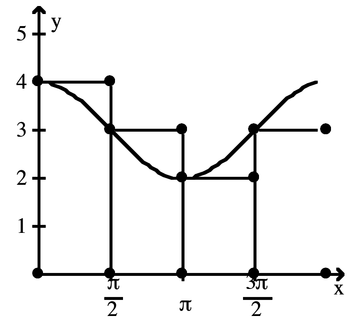
29) $f(x) = \cos x + 3$, $[0, 2\pi]$, right–hand endpoint 29) _______



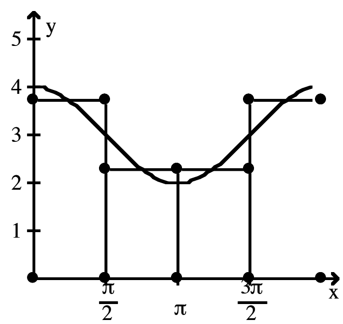
A)



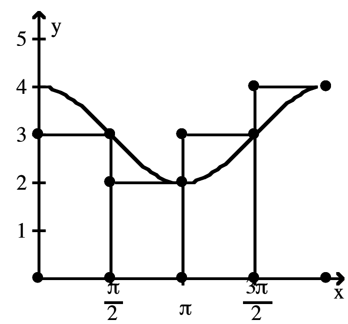
B)



C)



D)



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

30) $f(x) = x^2$ between $x = 1$ and $x = 5$ using the midpoint sum with four rectangles of equal width. 30) _______

A) 41 B) 69 C) 54 D) 30

Graph the integrand and use geometry to evaluate the integral.

31) $\int_{-6}^{6} \sqrt{36 - x^2}\, dx$ 31) _______

A) 36 B) 36π C) 18π D) 6π

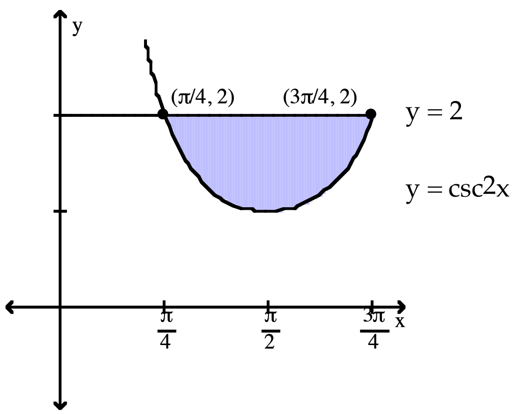
Solve the problem.

32) Suppose that f is continuous and that $\int_{-3}^{3} f(z)\, dz = 0$ and $\int_{-3}^{6} f(z)\, dz = 3$. Find $-\int_{3}^{6} 4f(x)\, dx$. 32) _______

A) -4 B) -3 C) -12 D) 12

Find the area of the shaded region.

33) 33) _______



A) $\pi + 2$ B) $\pi - 2$ C) π D) 2

Evaluate the integral.

34) $\int_{0}^{\ln 4} e^{2x}\, dx$ 34) _______

A) 8 B) 15 C) $\frac{15}{2}$ D) 16

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

35) $y = (x + 4)\sqrt{x};\ 1 \le x \le 16$ 35) _______

A) $\frac{2886}{5}$ B) 1275 C) $\frac{5871}{2}$ D) $\frac{591}{2}$

Find the derivative.

36) $y = \int_{0}^{\tan x} \sqrt{t}\, dt$ 36) _______

A) $\sec^2 x \sqrt{\tan x}$ B) $\frac{2}{3} \tan^{3/2} x$ C) $\sec x \tan^{3/2} x$ D) $\sqrt{\tan x}$

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

37) $y = 3 - x^2$; $[-2, 2]$ 37) _______

A) $-\frac{1}{3}$ B) 0 C) $\frac{5}{3}$ D) 3

Evaluate the integral using the given substitution.

38) $\int \frac{dx}{\sqrt{7x+2}}$, $u = 7x + 2$ 38) _______

A) $2\sqrt{7x+2} + C$

B) $\frac{7}{2}\frac{1}{\sqrt{7x+2}} + C$

C) $\frac{1}{7(7x+2)^{3/2}} + C$

D) $\frac{2}{7}\sqrt{7x+2} + C$

Evaluate the integral.

39) $\int \frac{1}{t^2} \sin\left(\frac{3}{t} + 5\right)\ dt$ 39) _______

A) $3 \cos\left(\frac{3}{t} + 5\right) + C$

B) $-\cos\left(\frac{3}{t} + 5\right) + C$

C) $\frac{1}{3} \cos\left(\frac{3}{t} + 5\right) + C$

D) $-\frac{1}{3} \cos\left(\frac{3}{t} + 5\right) + C$

40) $\int \frac{e^x\, dx}{\sqrt{1 - e^{2x}}}$ 40) _______

A) $\sec^{-1}(e^x) + C$

B) $\sin^{-1}(e^x) + C$

C) $-2\sqrt{1 - e^{2x}} + C$

D) $e^x \sin^{-1}(e^x) + C$

Use the substitution formula to evaluate the integral.

41) $\int_0^{\pi/2} \frac{\cos x}{(4 + 2 \sin x)^3}\, dx$ 41) _______

A) $\frac{5}{576}$ B) $\frac{5}{288}$ C) $-\frac{15}{64}$ D) $-\frac{5}{288}$

42) $\int_0^{\ln \sqrt{3}/4} \frac{4 e^{4x}\, dx}{1 + e^{8x}}$ 42) _______

A) $-\frac{\pi}{12}$ B) $\frac{\pi}{12}$ C) $\frac{\pi}{6}$ D) $-\frac{\pi}{6}$

Solve the problem.

43) Given the acceleration, initial velocity, and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 43) _______

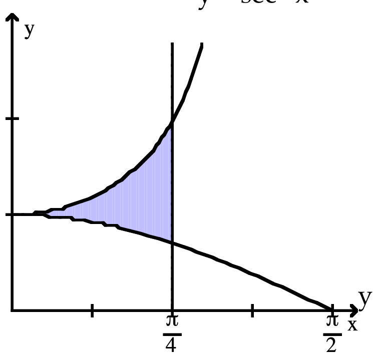
$a = 32\cos 2t$, $v(0) = -7$, $s(0) = -1$

A) $s = -8\sin 2t - 7t - 1$ B) $s = -8\cos 2t - 7t - 1$

C) $s = 8\sin 2t - 7t - 1$ D) $s = 8\cos 2t + 7t - 1$

Find the area of the shaded region.

44) $y = \sec^2 x$ 44) _______



A) $2 - \sqrt{2}$ B) $\frac{\sqrt{2}}{2}$ C) $1 - \frac{\sqrt{2}}{2}$ D) $1 + \sqrt{2}$

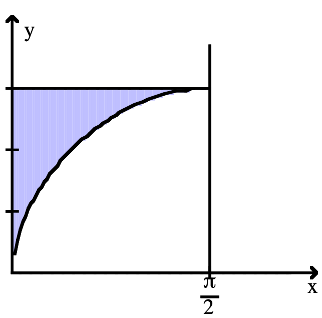
Find the area enclosed by the given curves.

45) Find the area of the region in the first quadrant bounded by the line $y = 8x$, the line $x = 1$, the curve $y = \frac{1}{\sqrt{x}}$, and the x-axis. 45) _______

A) $\frac{3}{4}$ B) $\frac{3}{2}$ C) $\frac{5}{4}$ D) 6

Find the volume of the solid generated by revolving the shaded region about the given axis.

46) About the x-axis 46) _______



$y = 3\sqrt{\sin x}$

A) $\frac{9}{2}\pi^2 - 9\pi$ B) $\frac{9}{2}\pi^2 - 3\pi$ C) $\frac{9}{2}\pi^2 + 9\pi$ D) $\frac{9}{2}\pi^2$

Find the volume of the solid generated by revolving the region bounded by the given lines and curves about the x–axis.

47) $y = \dfrac{1}{\sqrt{x}}$, $y = 0$, $x = 1$, $x = 9$ 47) _______

A) $\dfrac{\pi}{9}$ B) $\dfrac{\pi}{2}(\ln 9)$ C) $\pi(\ln 9)$ D) 3π

Find the length of the curve.

48) $y = \displaystyle\int_0^x \sqrt{4\sin^2 t - 1}\, dt$, $0 \le x \le \dfrac{\pi}{2}$ 48) _______

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

Evaluate the integral.

49) $\displaystyle\int \frac{\sec x \tan x}{5 + \sec x}\, dx$ 49) _______

A) $5 \ln |\sec x| + C$ B) $\ln |5 + \sec x| + C$
C) $-\ln |5 + \sec x| + C$ D) $5 \ln |5 + \sec x| + C$

Find the derivative of y with respect to x, t, or θ, as appropriate.

50) $y = \ln(\cos(\ln \theta))$ 50) _______

A) $-\dfrac{\tan(\ln \theta)}{\theta}$ B) $\tan(\ln \theta)$ C) $-\tan(\ln \theta)$ D) $\dfrac{\tan(\ln \theta)}{\theta}$

Evaluate the integral.

51) $\displaystyle\int_0^{\sqrt{\ln \pi}} 2x\, e^{x^2} \sin\left(e^{x^2}\right)\, dx$ 51) _______

A) $1 + \cos 1$ B) 1 C) $1 - \cos 1$ D) -1

52) $\displaystyle\int (2x-1) \ln(21x)\, dx$ 52) _______

A) $\left(x^2 - x\right)\ln 21x - x^2 + x + C$ B) $\left(x^2 - x\right)\ln 21x - \dfrac{x^2}{2} + 2x + C$

C) $\left(\dfrac{x^2}{2} - x\right)\ln 21x - \dfrac{x^2}{4} + x + C$ D) $\left(x^2 - x\right)\ln 21x - \dfrac{x^2}{2} + x + C$

53) $\displaystyle\int_1^3 \ln 5x\, dx$ 53) _______

A) 8.51 B) 4.51 C) -3.49 D) 14.4

54) $\int_{0}^{\pi/8} \sin^3 8x \, dx$ 54) _______

A) $\frac{1}{6}$ B) 0 C) $\frac{1}{12}$ D) $\frac{1}{8}$

Evaluate the improper integral or state that it is divergent.

55) $\int_{1}^{\infty} \frac{dx}{x^{2.366}}$ 55) _______

A) $\frac{1}{3.366}$ B) Divergent C) $\frac{1}{2.366}$ D) $\frac{1}{1.366}$

56) $\int_{-\infty}^{e} 10e^{-x} \, dx$ 56) _______

A) 10 B) 20 C) Divergent D) -10

Answer Key
Testname: 121 PRACTICE FINAL

1) C
2) A
3) D
4) A
5) A
6) A
7) C
8) B
9) D
10) A
11) A
12) A
13) A
14) C
15) C
16) C
17) C
18) C
19) B
20) D
21) C
22) C
23) D
24) A
25) C
26) D
27) D
28) A
29) D
30) A
31) C
32) C
33) B
34) C
35) A
36) A
37) C
38) D
39) C
40) B
41) A
42) B
43) B
44) C
45) C
46) A
47) C
48) D
49) B

50) A
51) A
52) D
53) B
54) A
55) D
56) C