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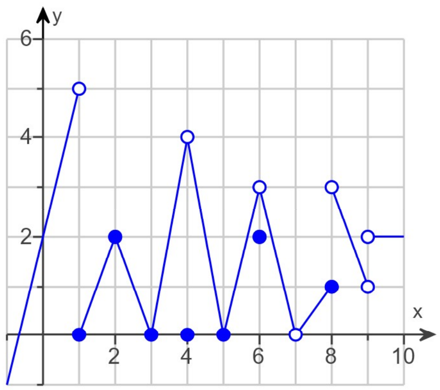
Course: Calc 1 11:30 AM / Internet (81749&81750) Shcherban

Assignment: Final Exam Review

1. For the graph g(x) graphed below, find the following limits, if they exist.

a) $\lim_{x\to2} g(x)$ b) $\lim_{x\to8} g(x)$ c) $\lim_{x\to4} g(x)$



a) Find $\lim_{x\to2} g(x)$. Select the correct choice below and fill in any answer boxes in your choice.

A. $\lim_{x\to2} g(x) =$ 2

B. The limit does not exist.

b) Find $\lim_{x\to8} g(x)$. Select the correct choice below and fill in any answer boxes in your choice.

A. $\lim_{x\to8} g(x) =$

B. The limit does not exist.

c) Find $\lim_{x\to4} g(x)$. Select the correct choice below and fill in any answer boxes in your choice.

A. $\lim_{x\to4} g(x) =$ 4

B. The limit does not exist.

2. Evaluate the following limit.

$$\lim_{x\to1}\left(3x^3-5x^2+3x+4\right)$$

$\lim_{x\to1}\left(3x^3-5x^2+3x+4\right) =$ 5 (Simplify your answer.)

3. Find $\lim_{x\to14}\dfrac{x-14}{x^2-196}$.

$\lim_{x\to14}\dfrac{x-14}{x^2-196} = \dfrac{1}{28}$

(Type an integer or a simplified fraction.)

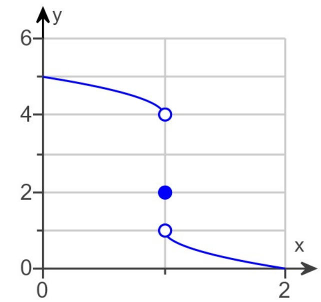
4. Find the limit.

$$\lim_{x\to0}(6\sin x-5)$$

$\lim_{x\to0}(6\sin x-5) =$ -5 (Type an integer or a simplified fraction.)

5.

For the function graphed to the right, explain why $\lim_{x \to 1} f(x) \neq 1$.



Choose the correct reason below.

- A. The limit of f(x) as x approaches 1 is $\frac{5}{2}$.
- B. The limit of f(x) as x approaches 1 is 2.
- ✓ C. The limit of f(x) as x approaches 1 does not exist.
- D. The limit of f(x) as x approaches 1 is 4.

6. Find the following limit.

$$\lim_{x \to -0.2^+} \sqrt{\frac{x+5}{x+1}}$$

$$\lim_{x \to -0.2^+} \sqrt{\frac{x+5}{x+1}} = \sqrt{6}$$

7. At what points is the function $y = \frac{x+1}{x^2 - 10x + 9}$ continuous?

Describe the set of x-values where the function is continuous, using interval notation.

$(-\infty,1) \cup (1,9) \cup (9,\infty)$

(Simplify your answer. Type your answer in interval notation.)

8. Find the limit of $f(x) = \frac{3x+6}{5x+2}$ as x approaches ∞ and as x approaches $-\infty$.

$\lim_{x \to \infty} f(x) = \frac{3}{5}$

(Type a simplified fraction.)

$\lim_{x \to -\infty} f(x) = \frac{3}{5}$

(Type a simplified fraction.)

9. Find the limit of $f(x) = \dfrac{6x^9 + 6x^8 + 7}{4x^{10}}$ as x approaches ∞ and as x approaches $-\infty$.

$\lim\limits_{x \to \infty} f(x) =$ 0

(Type a simplified fraction.)

$\lim\limits_{x \to -\infty} f(x) =$ 0

(Type a simplified fraction.)

10. Find the limit.

$$\lim_{x \to (5\pi/2)^+} 5 \tan x$$

$\lim\limits_{x \to (5\pi/2)^+} 5 \tan x =$ $-\infty$

(Simplify your answer.)

11. Find the slope of the function's graph at the given point. Then find an equation for the line tangent to the graph there.

$$f(x) = x^2 - 9, \ (4,7)$$

What is the slope of the function's graph at the given point?

m = 8 (Simplify your answer.)

Find an equation for the line tangent to the graph at the given point.

y = $8x - 25$

12. An object is dropped from the top of a cliff 675 meters high. Its height above the ground t seconds after it is dropped is $675 - 4.9t^2$. Determine its speed 7 seconds after it is dropped.

The speed of the object 7 seconds after it is dropped is 68.6 m/sec.

(Simplify your answer.)

13. Differentiate the function and find the slope of the tangent line at the given value of the independent variable.

$$s = t^3 - t^2, \quad t = -1$$

$s'(t) =$ $3t^2 - 2t$

The slope of the tangent line is 5 at $t = -1$.

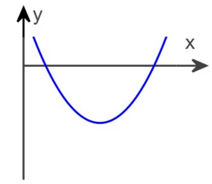
14. Find the value of the derivative.

$$\left.\frac{dy}{dx}\right|_{x=-4} \text{ if } y = 7 - 8x^2$$

If $y = 7 - 8x^2$, $\left.\dfrac{dy}{dx}\right|_{x=-4} =$ 64. (Simplify your answer.)

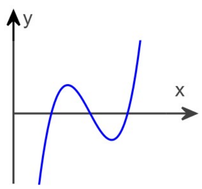
15.

Graph the derivative of the function graphed on the right.

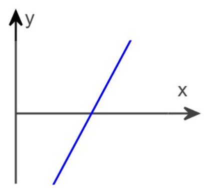


Choose the correct graph below.

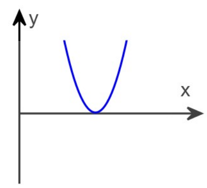
A.



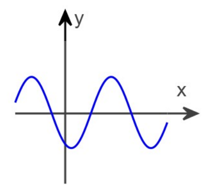
B.



C.

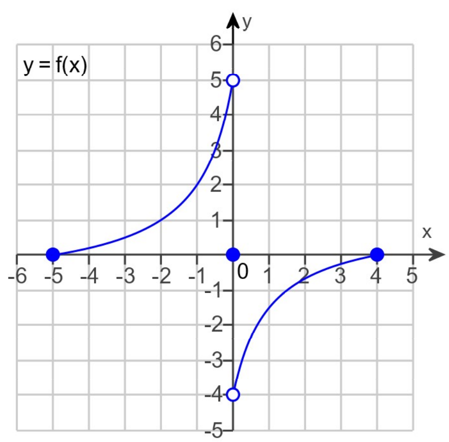


D.



16.

The figure below shows the graph of a function over the closed interval $-5 \le x \le 4$. Complete parts (a) through (c) to the right.



a. At what domain points does the function appear to be differentiable?

A. $-5 \le x < 0,\ 0 < x \le 4$

B. $-5 \le x \le 4$

C. $x = 0$

D. None

b. At what domain points does the function appear to be continuous but not differentiable?

A. $-5 \le x \le 4$

B. $x = 0$

C. $-5 \le x < 0,\ 0 < x \le 4$

D. None

c. At what domain points does the function appear to be neither continuous nor differentiable?

A. $-5 \le x \le 4$

B. $x = 0$

C. $-5 \le x < 0,\ 0 < x \le 4$

D. None

17. Find the first and second derivatives.

$$y = 6x^2 - 14x - 7x^{-3}$$

$$\frac{dy}{dx} = 12x - 14 + \frac{21}{x^4}$$

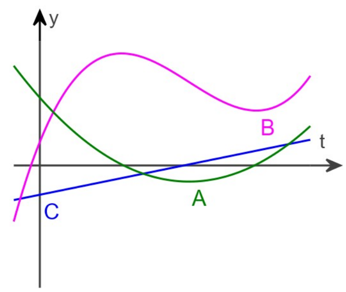
$$\frac{d^2y}{dx^2} = -\frac{84}{x^5} + 12$$

18. Find the derivative of the function.

$$y = \frac{4x-7}{6x+1}$$

The derivative is $y' = \dfrac{46}{(6x+1)^2}$.

19. The graphs in the accompanying figure show the position s, velocity $v = \frac{ds}{dt}$, and acceleration $a = \frac{d^2s}{dt^2}$ of a body moving along a coordinate line as functions of time t. Which graph is which?



Choose the correct answer below.

- **A.** The graph labeled B is the graph of the position s, the graph labeled C is the graph of the velocity v, and the graph labeled A is the graph of the acceleration a.
- **B.** The graph labeled B is the graph of the position s, the graph labeled A is the graph of the velocity v, and the graph labeled C is the graph of the acceleration a.
- **C.** The graph labeled C is the graph of the position s, the graph labeled A is the graph of the velocity v, and the graph labeled B is the graph of the acceleration a.
- **D.** The graph labeled A is the graph of the position s, the graph labeled B is the graph of the velocity v, and the graph labeled C is the graph of the acceleration a.

20. Suppose that the dollar cost of producing x appliances is $c(x) = 1100 + 130x - 0.1x^2$.
a. Find the average cost per appliance of producing the first 140 appliances.
b. Find the marginal cost when 140 appliances are produced.
c. Show that the marginal cost when 140 appliances are produced is approximately the cost of producing one more appliance after the first 140 have been made, by calculating the latter cost directly.

The average cost per appliance of producing the first 140 appliances is $ 123.86 / appliance.
(Round to the nearest cent as needed.)

The marginal cost when 140 appliances are produced is $ 102 .
(Round to the nearest cent as needed.)

The cost of producing one more appliance beyond 140 appliances is $ 101.9 .
(Round to the nearest cent as needed.)

21. Find $\frac{dy}{dx}$ for $y = -6x + 5\cos x$.

$$\frac{d}{dx}(-6x + 5\cos x) = -6 - 5\sin x$$

22. Find $\frac{ds}{dt}$ for $s = \tan t - t$.

$$\frac{ds}{dt} = \tan^2 t$$

23. Find the derivative of the function $y = \sqrt{4 - 3x}$.

$$\frac{dy}{dx} = -\frac{3}{2\sqrt{4 - 3x}}$$

24. Find the derivative of the function below.

$$r = \sin\left(\theta^2\right)\cos(4\theta)$$

$$\frac{dr}{d\theta} = 2\theta\cos\left(\theta^2\right)\cos(4\theta) - 4\sin(4\theta)\sin\left(\theta^2\right)$$

25. Find y'' for $y = \left(5 + \frac{4}{x}\right)^3$.

$$y'' = \frac{-24(5x + 4)(-5x - 8)}{x^5}$$

26. Use implicit differentiation to find dy / dx.

$$2xy + y^2 = 9x + y$$

$$\frac{dy}{dx} = \frac{9 - 2y}{2x + 2y - 1}$$

27. If $x^3 + y^3 = 37$, find the value of $\frac{d^2y}{dx^2}$ at the point $(-3,4)$.

The value of $\frac{d^2y}{dx^2}$ at the point $(-3,4)$ is $\frac{111}{512}$.
(Type a simplified fraction.)

28. Assume that $x = x(t)$ and $y = y(t)$. Let $y = x^3 + 6$ and $\frac{dx}{dt} = 3$ when $x = 1$.

Find $\frac{dy}{dt}$ when $x = 1$.

$\frac{dy}{dt} = 9$ (Simplify your answer.)

29. Assume that all variables are implicit functions of time t. Find the indicated rate.

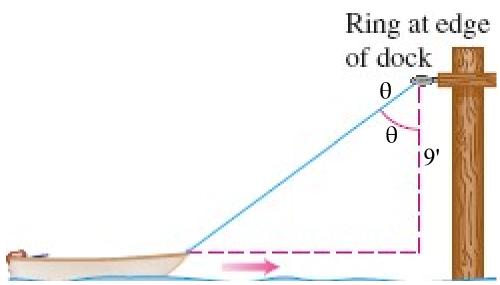
$$x^2 + 2y^2 + 2y = 16; \frac{dx}{dt} = 5 \text{ when } x = 2 \text{ and } y = -3; \text{ find } \frac{dy}{dt}$$

$\frac{dy}{dt} = 2$ (Simplify your answer.)

30. When a circular plate of metal is heated in an oven, its radius increases at a rate of 0.04 cm / min. At what rate is the plate's area increasing when the radius is 48 cm?

The rate of change of the area is 3.84π cm^2 / min.
(Type an exact answer in terms of π.)

31. A dinghy is pulled toward a dock by a rope from the bow through a ring on the dock 9 feet above the bow. The rope is hauled in at the rate of 3 ft/sec. Complete parts **a.** and **b.**



a. How fast is the boat approaching the dock when 15 ft of rope are out?

The distance between the boat and the dock is changing at a rate of $-\frac{15}{4}$ ft/sec.

(Type an integer or a simplified fraction.)

b. At what rate is the angle θ changing at this instant? $-\frac{3}{20}$ rad/sec.

(Type an integer or a simplified fraction.)

32. Find dy for $y = 8x^4 - 9\sqrt{7x}$.

$dy = \left(32x^3 - \frac{9\sqrt{7}}{2\sqrt{x}}\right)dx$

33. Find dy.

$$y = \cos\left(7\sqrt{x}\right)$$

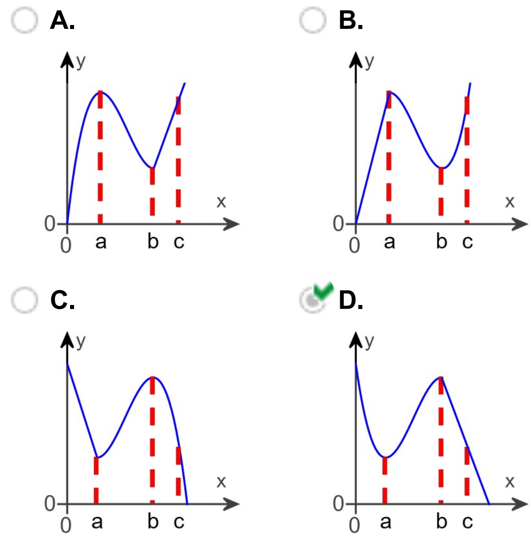
$$dy = \frac{-7\sin\left(7\sqrt{x}\right)}{2\sqrt{x}}\,dx$$

34. Find the graph given the following table.

x	f′(x)
a	0
b	does not exist
c	−5

Choose the correct graph below.

A. B. C. D.



35. Find the absolute maximum and minimum values of the function on the given interval.

$f(x) = -x^2 + 1, \quad -2 \le x \le 1$

The absolute maximum of the function $f(x) = -x^2 + 1$ on the interval $-2 \le x \le 1$ has a value of 1.
(Simplify your answer.)

The absolute minimum of the function $f(x) = -x^2 + 1$ on the interval $-2 \le x \le 1$ has a value of −3.
(Simplify your answer.)

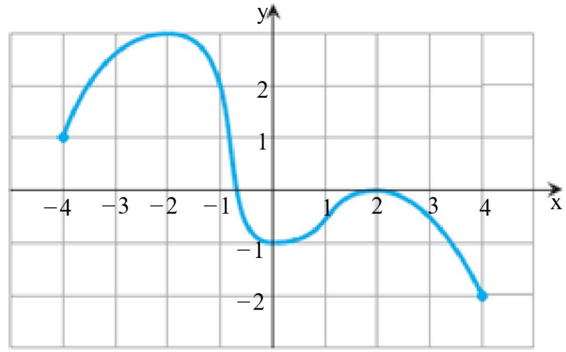
36. Determine all critical points for the following function.

$$f(x) = x(4-x)^3$$

x = 1,4 (Use a comma to separate answers as needed.)

37. **(a)** Find the open intervals on which the function shown in the graph is increasing and decreasing.

(b) Identify the function's local and absolute extreme values, if any, saying where they occur.



(a) On what open interval(s), if any, is the function increasing? Select the correct choice below and fill in any answer boxes within your choice.

A. The function is increasing on the open interval(s) $(-4,-2),(0,2)$.
(Type your answer in interval notation. Use a comma to separate answers as needed.)

B. The function is never increasing.

On what open interval(s), if any, is the function decreasing? Select the correct choice below and fill in any answer boxes within your choice.

A. The function is decreasing on the open interval(s) $(-2,0),(2,4)$.
(Type your answer in interval notation. Use a comma to separate answers as needed.)

B. The function is never decreasing.

(b) If the function has an absolute maximum, where does it occur? Select the correct choice below and fill in any answer boxes within your choice.

A. An absolute maximum occurs at the point(s) $(-2,3)$.
(Type an ordered pair. Use a comma to separate answers as needed.)

B. The function has no absolute maximum.

If the function has other local maxima, where do they occur? Since a list of local maxima automatically includes the absolute maximum, do not include the absolute maximum in the list of local maxima. Select the correct choice below and fill in any answer boxes within your choice.

A. A local maximum occurs at the point(s) $(2,0)$.
(Type an ordered pair. Use a comma to separate answers as needed.)

B. The function has no local maximum that is not an absolute maximum.

If the function has an absolute minimum, where does it occur? Select the correct choice below and fill in any answer boxes within your choice.

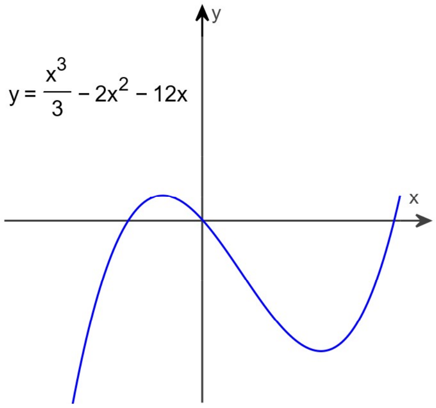
A. An absolute minimum occurs at the point(s) $(4,-2)$.
(Type an ordered pair. Use a comma to separate answers as needed.)

B. The function has no absolute minimum.

If the function has other local minima, where do they occur? Since a list of local minima automatically includes the absolute minimum, do not include the absolute minimum in the list of local minima. Select the correct choice below and fill in any answer boxes within your choice.

A. A local minimum occurs at the point(s) $(-4,1),(0,-1)$.
(Type an ordered pair. Use a comma to separate answers as needed.)

38. Identify the inflection points and local maxima and minima of the function graphed below. Identify the intervals on which it is concave up and concave down.



The curve $y = \frac{x^3}{3} - 2x^2 - 12x$ has a point of inflection at $\left(2, -\frac{88}{3}\right)$.

(Type an ordered pair. Type a simplified fraction.)

Choose the correct answer regarding local maxima and minima.

- **A.** Local maximum: -72 at $x = 6$
  Local minimum: $\frac{40}{3}$ at $x = -2$
- **B.** Local maximum: $\frac{40}{3}$ at $x = -2$
  Local minimum: -72 at $x = 6$
- **C.** No local maxima or minima
- **D.** Local minima: $-\frac{88}{3}$ at $x = 2$

Choose the correct answer regarding concavity.

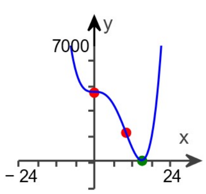
- **A.** Concave down on $(-\infty,2)$
  Concave up on $(2,\infty)$
- **B.** Concave down on $(-\infty,\infty)$
- **C.** Concave up on $(-\infty,\infty)$
- **D.** Concave up on $(-\infty,2)$
  Concave down on $(2,\infty)$

39. The first derivative of a continuous function $y = f(x)$ is $y' = x(x-15)^2$. Find y'' and then use the graphing procedure to sketch the general shape of the graph of f.

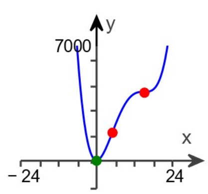
$y'' = 3x^2 - 60x + 225$

Choose the correct graph below.

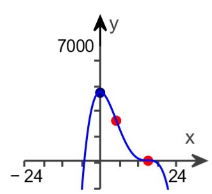
A.



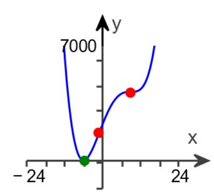
B.



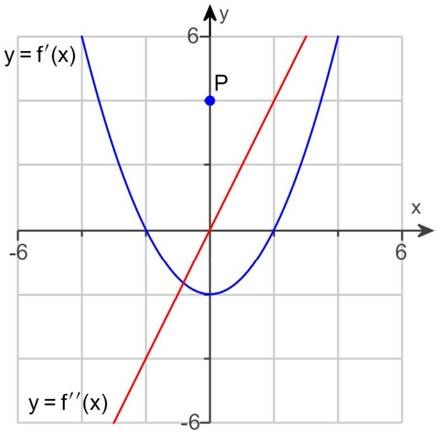
C.



D.

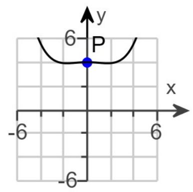


40. The given figure shows the graphs of the first and second derivatives of a function $y = f(x)$. Sketch the approximate graph of f, given that the graph passes through the point P.

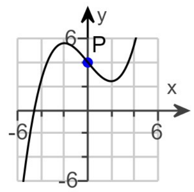


Which of the following is the correct graph of the function $y = f(x)$?

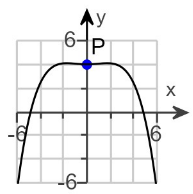
A.



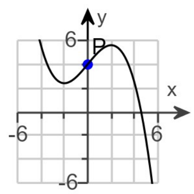
B. ✔



C.



D.

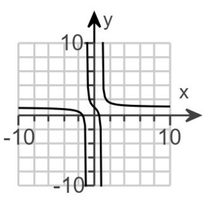


41. Graph the following rational function.

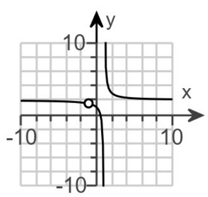
$$y = \frac{2x^2 + x - 1}{x^2 - 1}$$

Choose the correct graph below.

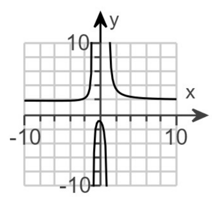
A.



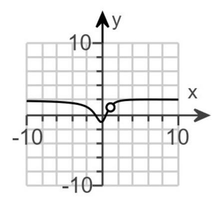
B. ✔



C.



D.



42. A rectangular plot of farmland will be bounded on one side by a river and on the other three sides by a single-strand electric fence. With 600 m of wire at your disposal, what is the largest area you can enclose, and what are its dimensions?

The maximum area of the rectangular plot is 45000 m^2.

The length of the shorter side of the rectangular plot is 150 m.

The length of the longer side of the rectangular plot is 300 m.

43. Find the antiderivative of the function $f(x) = -8 \sin(8x)$ when $C = 0$.

The antiderivative is **cos** (8x) .

44. Find the indefinite integral $\int (14x+6)dx$.

$\int (14x+6)dx =$ $x(7x+6)+c$

(Use C as an arbitrary constant.)

45. Find the indefinite integral $\int -9 \cos t \, dt$.

$\int -9 \cos t \, dt =$ $-9 \sin(t)+c$

(Use C as an arbitrary constant.)

46. Find the function y(x) satisfying $\frac{dy}{dx} = 4x-3$ and $y(6)=0$.

The function y(x) satisfying $\frac{dy}{dx} = 4x-3$ and $y(6)=0$ is $y(x) =$ $2x^2-3x-54$.

47. Write the sum without sigma notation. Then evaluate.

$$\sum_{k=3}^{7} \cos k\pi$$

Write out the sum.

$$\sum_{k=3}^{7} \cos k\pi = \cos(3\pi) + \cos(4\pi) + \cos(5\pi) + \cos(6\pi) + \cos(7\pi)$$

Evaluate the sum.

$$\sum_{k=3}^{7} \cos k\pi = -1$$ (Simplify your answer.)

48. Evaluate the sum $\sum_{k=1}^{9} (-6k)$.

$$\sum_{k=1}^{9} (-6k) = -270$$

(Simplify your answer.)

49. Express the limit $\lim_{\|P\|\to 0} \sum_{k=1}^{n} \left(c_k^9 - 4c_k\right) \Delta x_k$, P a partition of $[-6,9]$, as a definite integral.

The limit expressed as a definite integral is $\int_{-6}^{9} \left(x^9 - 4x \right) dx$.

50. Express the limit $\lim_{\|P\|\to 0} \sum_{k=1}^{n} \left(\sec c_k\right) \Delta x_k$ as a definite integral where P is a partition of $\left[0, \frac{\pi}{3}\right]$.

The limit expressed as a definite integral, is $\int_{0}^{\frac{\pi}{3}} \left(\sec x\right) dx$.

(Type an exact answer, using π as needed.)

51. Suppose that f is integrable, and that $\int_{0}^{4} f(z)dz = 6$ and $\int_{0}^{5} f(z)dz = 11$. Find the value of the following definite integrals.

(a) $\int_{4}^{5} f(z)dz = 5$ (Type an integer or a decimal.)

(b) $\int_{5}^{4} f(z)dz = -5$ (Type an integer or a decimal.)

52. Evaluate the integral $\int_{a}^{9a} x\,dx$.

The value of the integral $\int_{a}^{9a} x\,dx = 40a^2$.

53. Evaluate the integral $\int_{5}^{3} 2\,dx$.

The value of the integral $\int_{5}^{3} 2\,dx = -4$.

(Simplify your answer.)

54. Evaluate the following integral.

$$\int_{0}^{2} 5x(x-5)dx$$

$\int_{0}^{2} 5x(x-5)dx = -\frac{110}{3}$ (Simplify your answer.)

55. Evaluate the given definite integral.

$$\int_1^3 \left(3x^2 - \frac{x^3}{6}\right) dx$$

$$\int_1^3 \left(3x^2 - \frac{x^3}{6}\right) dx = \frac{68}{3}$$ (Simplify your answer.)

56. Evaluate the integral.

$$\int_0^{\pi/3} 2 \sec^2 x \, dx$$

$$\int_0^{\pi/3} 2 \sec^2 x \, dx = 2\sqrt{3}$$ (Type an exact answer, using radicals as needed.)

57. Evaluate the indefinite integral by using the substitution $u = x^2 + 1$ to reduce the integral to standard form.

$$\int 2x\left(x^2+1\right)^{-12} dx$$

$$\int 2x\left(x^2+1\right)^{-12} dx = -\frac{1}{11\left(x^2+1\right)^{11}} + c$$

(Use C as the arbitrary constant.)

58. Evaluate the indefinite integral by using the given substitution to reduce the integral to standard form.

$$\int \frac{14t^6 \, dt}{\sqrt{6-t^7}}, \ u = 6 - t^7$$

$$\int \frac{14t^6 \, dt}{\sqrt{6-t^7}} = -4\left(6-t^7\right)^{\frac{1}{2}} + c$$

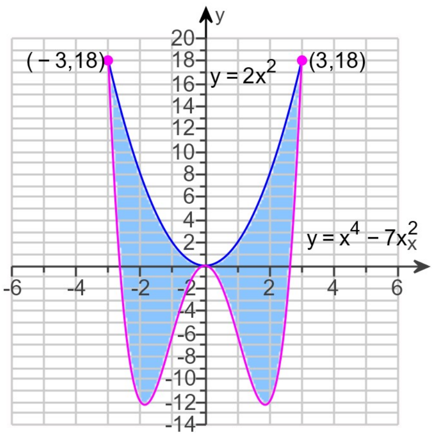
(Use C as the arbitrary constant.)

59. Use the substitution formula to evaluate the integral.

$$\int_0^{\pi} -3 \cos^2 x \sin x \, dx$$

$$\int_0^{\pi} -3 \cos^2 x \sin x \, dx = -2$$

60. Find the total area of the shaded regions.



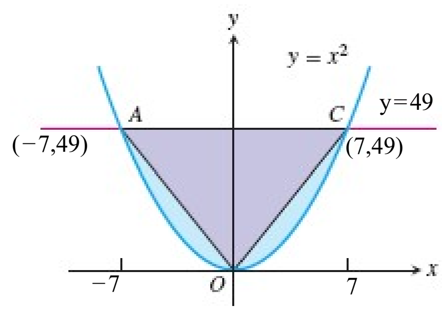
The area is $\frac{324}{5}$.

(Simplify your answer.)

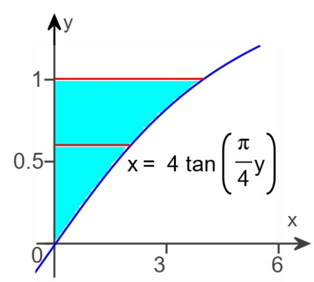
61. The figure here shows triangle AOC inscribed in the region cut from the parabola $y = x^2$ by the line $y = 49$. Find the ratio of the area of the triangle to the area of the parabolic region.

$\frac{A_{Triangle}}{A_{Parabola}} = \frac{3}{4}$

(Type a simplified fraction.)



62. Find the volume of the solid generated by revolving the shaded region about the y-axis.



The volume of the solid generated by revolving the shaded region about the y-axis is $64 - 16\pi$.

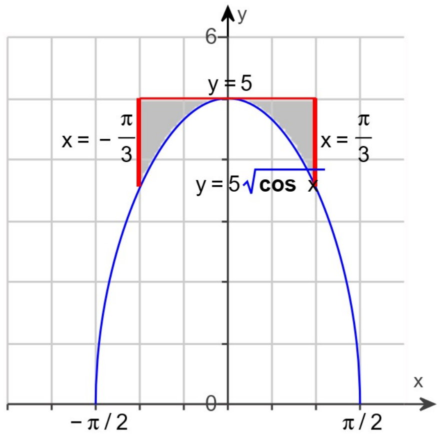
(Type an exact answer, using π as needed.)

63. Find the volume of the solid generated by revolving the region bounded by $y = 4x^2$, $y = 0$, and $x = 4$ about the x-axis.

The volume of the solid generated by revolving the region bounded by $y = 4x^2$, $y = 0$, and $x = 4$ about the x-axis is $\frac{16384\pi}{5}$ cubic units.

(Type an exact answer, using π as needed.)

64. Use the washer method to find the volume of the solid generated by revolving the shaded region about the x-axis.



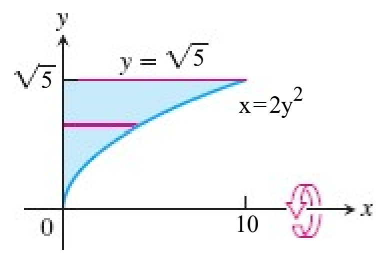
The volume of the solid generated by revolving the shaded region about the x-axis is 28.46 cubic units.
(Round to the nearest hundredth as needed.)

65. Find the volume of the solid generated by revolving the region bounded by the given curve and lines about the x-axis.

$y = 3x, \; y = 3, \; x = 0$

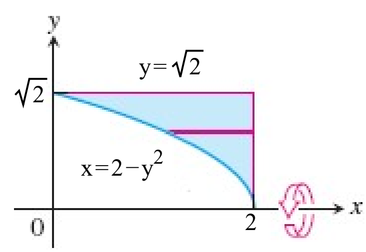
V = 6π
(Type an exact answer, using π as needed.)

66. Use the shell method to find the volume of the solid generated by revolving the shaded region about the x-axis.



The volume is 25π.
(Type an exact answer, using π as needed.)

67. Use the shell method to find the volume of the solid generated by revolving the shaded region about the x-axis.



The volume is 2π.
(Type an exact answer in terms of π.)

68. A force of 18 N will stretch a rubber band 12 cm (0.12 m). Assuming that Hooke's law applies, how far will a 15-N force stretch the rubber band? How much work does it take to stretch the rubber band this far?

How far will a 15-N force stretch the rubber band?

.1 m
(Simplify your answer.)

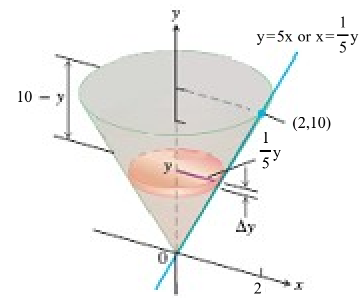
How much work does it take to stretch the rubber band this far?

$\frac{3}{4}$ J
(Simplify your answer.)

69. A mountain climber is about to haul up a 20-m length of hanging rope. How much work will it take if the rope weighs 0.6 N/m?

The amount of work required is 120 J.
(Type an integer or a decimal.)

70. The conical tank shown here is filled with olive oil weighing 57 lb/ft^3. How much work does it take to pump all of the oil to the rim of the tank?



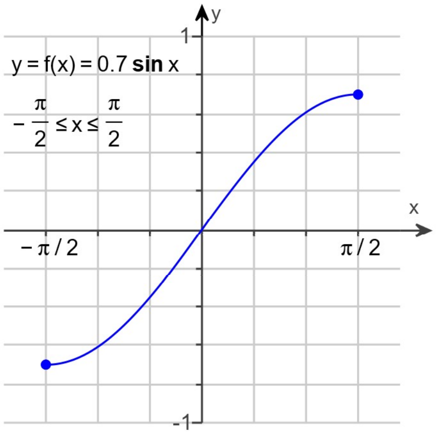
W = 5969 ft-lb (Round to the nearest whole number as needed.)

71. The viewing portion of the rectangular glass window in a fish tank is 81 inches wide and runs from 2.5 inches below the water's surface to 35.5 inches below the surface. Find the fluid force against this portion of the window. The weight-density of seawater is 64 lb / ft^3.

What is the fluid force against the window?

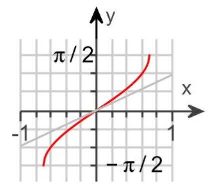
1881 lb

72. Graph $f^{-1}(x)$. Identify the domain and range of $f^{-1}(x)$.

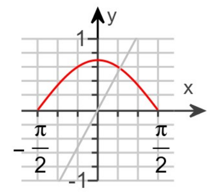


Choose the correct graph of $f^{-1}(x)$.

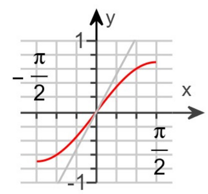
A.



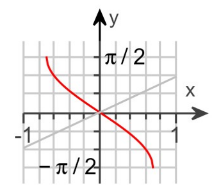
B.



C.



D.



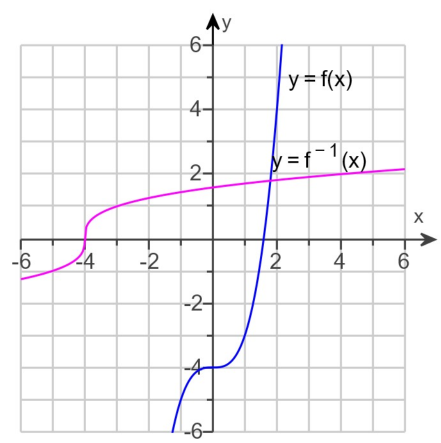
The domain of $f^{-1}(x)$ is $[-.7,.7]$.
(Type your answer in interval notation. Type an integer or a decimal.)

The range of $f^{-1}(x)$ is $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$.
(Type your answer in interval notation. Type an exact answer, using π as needed. Use integers or fractions for any numbers in the expression.)

73. The formula for a function $y = f(x)$ and the graphs of f and f^{-1} are given. Find a formula for f^{-1}.

$f(x) = x^3 - 4$

$f^{-1}(x) = \sqrt[3]{x+4}$
(Type an exact answer, using radicals as needed.)



74. Find the derivative of y with respect to x of $y = 8\ln(12x)$.

The derivative of y with respect to x of $y = 8\ln(12x)$ is $\frac{8}{x}$.

75. Find the derivative of y with respect to θ.

$y = \ln(\theta - 2)$

$\frac{dy}{d\theta} = \frac{1}{\theta - 2}$

76. Find the derivative of y with respect to t.

$y = t(\ln 5t)^2$

$\frac{dy}{dt} = \ln^2(5t) + 2\ln(5t)$

77. Evaluate the integral $\int_{-9}^{-2} \frac{dx}{x}$.

$\int_{-9}^{-2} \frac{dx}{x} = \ln 2 - \ln 9$

78. Evaluate the integral $\int_{0}^{\pi/2} \frac{2\sin(2t)}{4 - \cos(2t)}dt$.

$\int_{0}^{\pi/2} \frac{2\sin(2t)}{4 - \cos(2t)}dt = \ln 5 - \ln 3$

79. Evaluate the integral $\int \frac{4\sec^2(2t)}{9 + 2\tan(2t)}dt$.

$\int \frac{4\sec^2(2t)}{9 + 2\tan(2t)}dt = \ln(|2\tan(2t) + 9|) + C$

(Use C as the arbitrary constant.)

80. Find the derivative of y with respect to x if $y = e^{-8x}$.

The derivative of y with respect to x if $y = e^{-8x}$ is $-8e^{-8x}$.

81. Find the derivative of y with respect to x.

$y = 3xe^{3x} - e^{3x}$

$\frac{dy}{dx} = 9e^{3x}x$

82. Evaluate the integral.

$$\int \left(e^{8x} + 9e^{-x}\right) dx$$

$$\int \left(e^{8x} + 9e^{-x}\right) dx = \frac{e^{-x}\left(e^{9x} - 72\right)}{8} + C$$ (Use C as the arbitrary constant.)

83. Evaluate the integral.

$$\int_{\ln 1}^{\ln 7} e^{x}\, dx$$

$$\int_{\ln 1}^{\ln 7} e^{x}\, dx = 6$$

84. Evaluate the integral $\int_{\ln 16}^{\ln 25} e^{x/2} dx$.

$$\int_{\ln 16}^{\ln 25} e^{x/2} dx = 2$$

(Simplify your answer.)

85. Solve the initial value problem.

$$\frac{d^2y}{dx^2} = 3e^{-x},\ y(0) = 4,\ y'(0) = 0$$

$y = 3e^{-x} + 3x + 1$

86. Evaluate the integral $\int 2^x dx$.

$$\int 2^x dx = \frac{2^x}{\ln 2} + C$$

(Use C as an arbitrary constant.)