Student: ____________________	**Instructor:** Alfredo Alvarez	**Assignment:** math1325homework
Date: ____________________	**Course:** Bus Cal 1325	

1. Find the present value of the following future amount.

   \$300,000 at 8% compounded annually for 25 years

   What is the present value?

   \$ ______

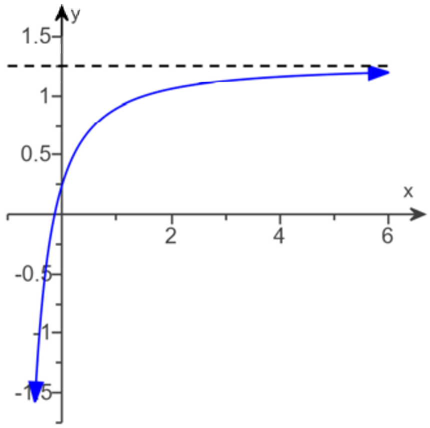
   (Round to the nearest cent.)

2. Find the half-life of a radioactive element, which decays according to the function $A(t) = A_0 e^{-0.0164t}$, where t is the time in years.

   The half-life of the element is ______ years.

   (Round to the nearest tenth.)

3. Refer to the figure below to find the limit $\lim_{x \to \infty} f(x)$.



   What is the limit? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

   - **A.** $\lim_{x \to \infty} f(x) =$ ______
   - **B.** The limit does not exist and is neither ∞ nor $-\infty$.

4. Explain why $\lim_{x\to 2} F(x)$ in Figure A exists, but $\lim_{x\to -2} f(x)$ in Figure B does not.

Figure A

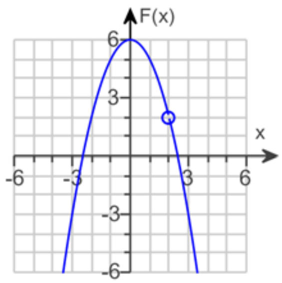
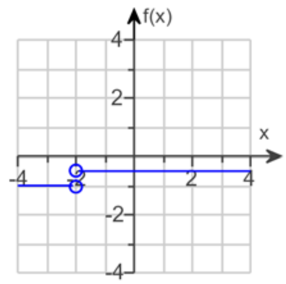


Figure B



Fill in the blanks below.

Since $\lim_{x\to 2^-} F(x)$ (1) ______ $\lim_{x\to 2^+} F(x)$, $\lim_{x\to 2} F(x)$ (2) ______

Since $\lim_{x\to -2^-} f(x)$ (3) ______ $\lim_{x\to -2^+} f(x)$, $\lim_{x\to -2} f(x)$ (4) ______

(1) ○ ≠ ○ =

(2) ○ exists. ○ does not exist.

(3) ○ ≠ ○ =

(4) ○ does not exist. ○ exist.

5. Use the table of values to estimate $\lim_{x\to 6} f(x)$.

x	5.9	5.99	5.999	5.9999	6.0001	6.001	6.01	6.1
f(x)	8.9	8.99	8.999	8.9999	9.0001	9.001	9.01	9.1

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

○ **A.** $\lim_{x\to 6} f(x) =$ ______

○ **B.** The limit does not exist and is neither ∞ nor $-\infty$.

6. If $k(x) = \frac{x^3 - 125}{x - 5}$, complete the table and use the results to find $\lim_{x\to 5} k(x)$.

x	4.9	4.99	4.999	5.001	5.01	5.1
k(x)						

Complete the table.

x	4.9	4.99	4.999	5.001	5.01	5.1
k(x)						

(Round to three decimal places as needed.)

Find the limit. Select the correct choice below and, if necessary, fill in the answer box within your choice.

○ **A.** $\lim_{x\to 5} \frac{x^3 - 125}{x - 5} =$ ______

○ **B.** The limit does not exist and is neither ∞ nor $-\infty$.

7. Construct a table and find the indicated limit.

If $h(x) = \frac{\sqrt{x} + 2}{x - 7}$, then find $\lim_{x \to 7} h(x)$.

Complete the table below.

x	6.9	6.99	6.999	7.001	7.01	7.1
h(x)						

(Type an integer or decimal rounded to four decimal places as needed.)

What is the limit? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $\lim_{x \to 7} \frac{\sqrt{x} + 2}{x - 7} =$ ______
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

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8. Let $\lim_{x \to 6} f(x) = 25$ and $\lim_{x \to 6} g(x) = 23$. Use the limit rules to find the limit below.

$$\lim_{x \to 6} [f(x) - g(x)]$$

What expression results from applying the appropriate limit rule?

[ ]

(Do not simplify.)

Find the limit.

$\lim_{x \to 6} [f(x) - g(x)] =$ [ ]

(Simplify your answer.)

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9. Use the properties of limits to help decide whether the limit exists. If the limit exists, find its value.

$$\lim_{x \to 9} \frac{x^2 - 2x - 63}{x - 9}$$

Select the correct choice below and, if necessary, fill in the answer box within your choice.

- **A.** $\lim_{x \to 9} \frac{x^2 - 2x - 63}{x - 9} =$ ______
  (Simplify your answer.)
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

10. Evaluate the following limit.

$$\lim_{h \to 0} \frac{\frac{6}{7+h} - \frac{6}{7}}{h}$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $\lim_{h \to 0} \frac{\frac{6}{7+h} - \frac{6}{7}}{h} =$ ______
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

11. Use properties of limits to find the indicated limit. It may be necessary to rewrite an expression before limit properties can be applied.

$$\lim_{x \to 16} \frac{\sqrt{x} - 4}{x - 16}$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $\lim_{x \to 16} \frac{\sqrt{x} - 4}{x - 16} =$ ______ (Type an integer or a simplified fraction.)
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

12. Use the properties of limits to help decide whether the limit exists. If the limit exists, find its value.

$$\lim_{x \to \infty} \frac{7x}{2x - 1}$$

Select the correct choice below and, if necessary, fill in the answer box within your choice.

- **A.** $\lim_{x \to \infty} \frac{7x}{2x - 1} =$ ______
  (Simplify your answer. Type an integer or a fraction.)
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

13. Use the properties of limits to help decide whether each limit exists. If a limit exists, find its value.

$$\lim_{x \to \infty} \frac{2x^2 + 2x}{4x^2 - 4x + 1}$$

Select the correct choice below and, if necessary, fill in the answer box within your choice.

- **A.** $\lim_{x \to \infty} \frac{2x^2 + 2x}{4x^2 - 4x + 1} =$ ______
  (Simplify your answer. Type an integer or a fraction.)
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

14. Calculate the limit in the following exercise, using a table. Verify your answer by using a graphing calculator.

$$\lim_{x \to -6} \frac{x^2 - 36}{x + 6}$$

Let $f(x) = \frac{x^2 - 36}{x + 6}$. Complete the table below.

x	−6.1	−6.01	−6.001	−5.999	−5.99	−5.9
f(x)						

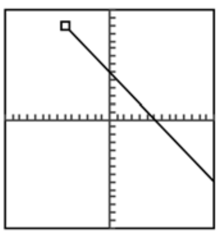
(Round to three decimal places as needed.)

Determine the limit.

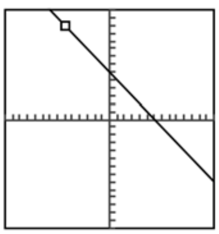
$$\lim_{x \to -6} \frac{x^2 - 36}{x + 6} = \square$$

Verify your answer by using a graphing calculator. Choose the correct graph below. The graph below is displayed on a [−14,14,1] by [−14,14,1] window.

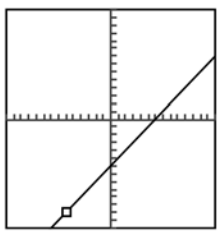
A.



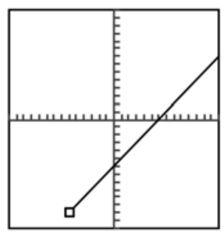
B.



C.



D.



15. Calculate the limit in the following exercise, using a table. Verify your answer by using a graphing calculator.

$$\lim_{x\to 4} \frac{x^2+4x-32}{x^2-16}$$

Let $f(x) = \frac{x^2+4x-32}{x^2-16}$. Complete the table below.

x	3.9	3.99	3.999	4.001	4.01	4.1
f(x)						

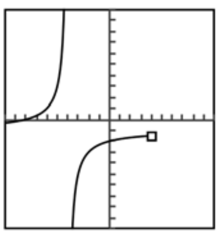
(Round to three decimal places as needed.)

$$\lim_{x\to 4} \frac{x^2+4x-32}{x^2-16} = \square$$

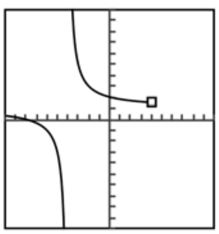
(Type an integer or decimal rounded to three decimal places as needed.)

Verify your answer by using a graphing calculator. Choose the correct graph below. The graph below is displayed on a [10,10,1] by [10,10,1] window.

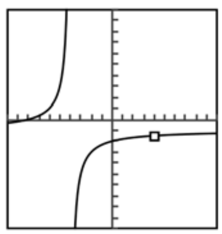
A.



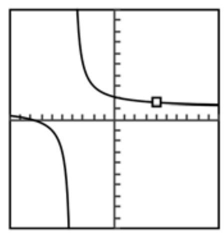
B.



C.



D.



16. Suppose that $f(t) = t^2 + 5t - 3$. What is the average rate of change of f(t) over the interval 1 to 2?

The average rate of change of f(t) over the interval 1 to 2 is $\square$.

17. Find the average rate of change of the function over the given interval.

$y = \sqrt{3x-2}$; between $x = 1$ and $x = 2$

What expression can be used to find the average rate of change?

A. $\lim_{h\to 0} \frac{f(2+h)-f(2)}{h}$

B. $\lim_{b\to a} \frac{f(b)-f(1)}{b-1}$

C. $\frac{f(2)-f(1)}{2-1}$

D. $\frac{f(2)+f(1)}{2+1}$

The average rate of change of y between $x = 1$ and $x = 2$ is $\square$.
(Simplify your answer.)

18. Find the average rate of change of the function over the given interval.

$y = \sqrt{5x+1}$;   between x = 0 and x = 3

The average rate of change of y between x = 0 and x = 3 is _____.
(Simplify your answer. Type an integer or a simplified fraction.)

19. Find the average rate of change for the function over the given interval.

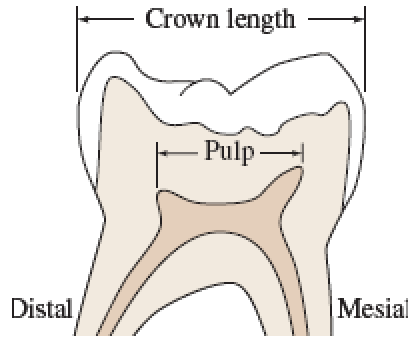
$y = e^{x}$ between x = 2 and x = 6

The average rate of change of y between x = 2 and x = 6 is _____.
(Round to four decimal places as needed.)

20. Suppose the position of an object moving in a straight line is given by $s(t) = 3t^2 + 4t + 2$. Find the instantaneous velocity when t = 5.

The instantaneous velocity at t = 5 is _____.

21. The crown length of first molars in fetuses is related to the postconception age of the tooth and is approximated as $L(t) = -0.01t^2 + 0.788t - 7.046$, where L(t) is the crown length, in millimeters, of the molar t weeks after conception. Answer parts a-c.



a. Find the average rate of growth in the crown length during weeks 21 through 25. Which of the following is the correct expression for the average rate of change?

- **A.** $\frac{L(25) - L(21)}{21}$
- **B.** $\frac{L(25) - L(21)}{25}$
- **C.** $\frac{L(25)}{25} - \frac{L(21)}{21}$
- **D.** $\frac{L(25) - L(21)}{25 - 21}$

The average rate of growth in crown length during weeks 21 through 25 is ______ (1) ______
(Type an integer or a decimal.)

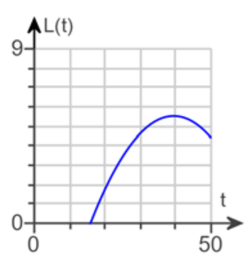
b. Find the instantaneous rate of growth in crown length when the tooth is exactly 21 weeks of age. Which of the following is a correct expression for instantaneous rate of change?

- **A.** $\lim_{h \to 0} \frac{L(21 + h) - L(21)}{h}$
- **B.** $\lim_{h \to 0} \frac{L(21 + h) - L(21 - h)}{h}$
- **C.** $\lim_{h \to 0} \frac{L(21 + h) - L(21)}{25}$
- **D.** $\lim_{h \to 0} \frac{L(21 + h) - L(21)}{21}$

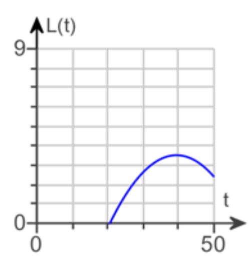
The instantaneous rate of growth in crown length when the tooth is exactly 21 weeks of age is ______ (2) ______
(Type an integer or a decimal.)

c. Graph the function on [0, 50] by [0, 9]. Choose the correct graph below.

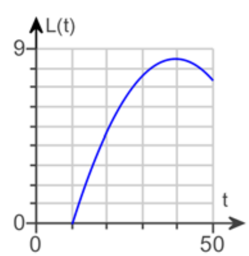
A.



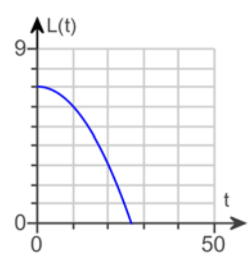
B.



C.



D.



Does a function that increases and then begins to decrease make sense for this particular application?

- **A.** No, because after a person is born the length of the crown of the tooth decreases.
- **B.** Yes, because the function will show the vertex at the minimum crown length.
- **C.** Yes, because after a person is born the length of the crown of the tooth decreases.
- **D.** No, because the crown length should reach a maximum length and then level off.

What is happening during the first 11 weeks?

- **A.** The first molars crown length have been decreasing.

Does this function accurately model crown length during the first 11 weeks?

- **A.** The function does accurately model crown length during the first 11 weeks because the length will be negative.
- **B.** The function does not accurately model crown length during the first 11 weeks because the length will be negative and this is not possible.
- **C.** The function does accurately model crown length during the first 11 weeks because according to the model the length will be 0 for the first 11 weeks.
- **D.** The function does not accurately model crown length during the first 11 weeks because the length is positive.

(1)
- mm^2 per week.
- mm per week.
- mm^3 per week.
- mm.

(2)
- mm.
- mm^3 per week.
- mm^2 per week.
- mm per week.

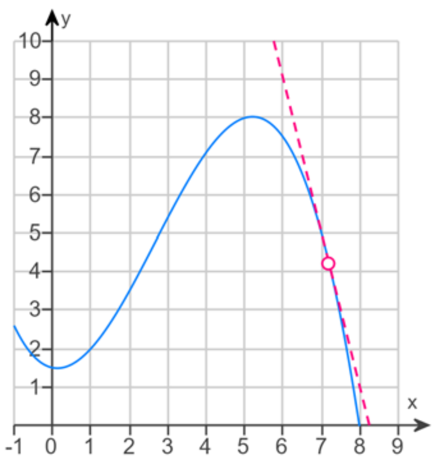
22.

If $f(x) = \frac{x^2 - 8}{x + 7}$, where is f not differentiable?

x = ______

23.

Estimate the slope (slope = rise/run) of the tangent line to the curve.

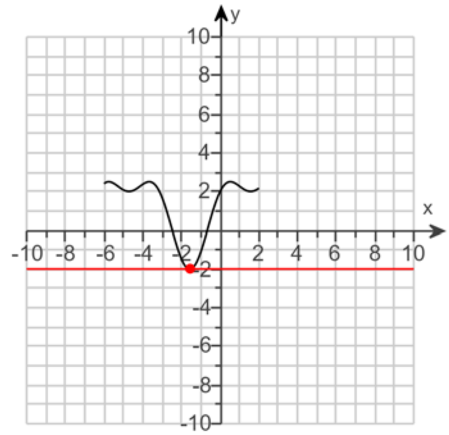


What is your estimate of the slope?

slope ≈ ______ (Round to the nearest integer.)

24. Estimate the slope of the tangent line to the curve at the given point $(-1.5, -1.985)$ on the graph to the right.

The slope of the tangent line is ______.
(Type an integer or decimal rounded to the nearest tenth as needed.)



25. Using the definition of the derivative, find $f'(x)$. Then find $f'(1)$, $f'(2)$, and $f'(3)$ when the derivative exists.

$$f(x) = -x^2 + 4x - 3$$

$f'(x) =$ ______
(Type an expression using x as the variable.)

Select the correct answer below and, if necessary, fill in the answer box to complete your choice.

- **A.** $f'(1) =$ ______
  (Type an integer or a simplified fraction.)
- **B.** The derivative does not exist.

Select the correct answer below and, if necessary, fill in the answer box to complete your choice.

- **A.** $f'(2) =$ ______
  (Type an integer or a simplified fraction.)
- **B.** The derivative does not exist.

Select the correct answer below and, if necessary, fill in the answer box to complete your choice.

- **A.** $f'(3) =$ ______
  (Type an integer or a simplified fraction.)
- **B.** The derivative does not exist.

26. Using the definition of the derivative, find f'(x). Then find $f'(-2)$, $f'(0)$, and $f'(3)$ when the derivative exists.

$$f(x) = \frac{16}{x}$$

$f'(x) =$ ______

(Type an expression using x as the variable.)

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $f'(-2) =$ ______
- **B.** The derivative does not exist.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $f'(0) =$ ______
- **B.** The derivative does not exist.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $f'(3) =$ ______ (Type an integer or a simplified fraction.)
- **B.** The derivative does not exist.

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27. Find $g'(x)$ for the given function. Then find $g'(-3)$, $g'(0)$, and $g'(2)$.

$$g(x) = \sqrt{14x}$$

Find $g'(x)$ for the given function.

$g'(x) =$ ______

Find $g'(-3)$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $g'(-3) =$ ______ (Type an exact answer.)
- **B.** The derivative does not exist.

Find $g'(0)$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $g'(0) =$ ______ (Type an exact answer.)
- **B.** The derivative does not exist.

Find $g'(2)$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $g'(2) =$ ______ (Type an exact answer.)
- **B.** The derivative does not exist.

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28. Find the derivative of the function.

$$y = x^3 - 8x^2 + 5x + 1$$

$y' =$ ______

29. Find the derivative of the function.

$$y = x^3 - \frac{x^2}{28} + 8x + 7$$

$y' =$ ☐

30. Find the derivative of the function.

$$y = 13x^2 - 8x - 9x^{-2}$$

$\frac{dy}{dx} =$ ☐

31. Find the derivative of the function.

$$y = \frac{9}{x^7} - \frac{9}{x}$$

$\frac{dy}{dx} =$ ☐

32. Find the derivative of the function.

$$y = \frac{4x^5 + 6}{x^3}$$

$y' =$ ☐

33. Find $f'(-4)$ if $f(x) = \frac{x^4}{7} - 9x$.

$f'(-4) =$ ☐ (Simplify your answer. Type an integer or a fraction.)

34. Find the slope of the tangent line to the graph of the given function at the given value of x. Find the equation of the tangent line.

$$y = x^4 - 2x^3 + 7;\ x = 1$$

How would the slope of a tangent line be determined with the given information?

- **A.** Substitute values of y into the equation and solve for x. Plot the resulting points to find the linear equation.
- **B.** Substitute values of x into the equation and solve for y. Plot the resulting points to find the linear equation.
- **C.** Substitute 1 for x into the derivative of the function and evaluate.
- **D.** Set the derivative equal to zero and solve for x.

The slope of the tangent line is ☐.

The equation of the line is ☐.
(Type an equation. Type your answer in slope-intercept form.)

35. Use the product rule to find the derivative of the function.

$$y = \left(5x^2 + 3\right)(3x - 5)$$

What is the correct way of writing the derivative of y?

- **A.** $\frac{dy}{dx} = \left(5x^2 + 3\right) \cdot (3x - 5) + \frac{d}{dx}(3x - 5) \cdot \frac{d}{dx}\left(5x^2 + 3\right)$
- **B.** $\frac{dy}{dx} = \left(5x^2 + 3\right) \cdot \frac{d}{dx}(3x - 5) + (3x - 5) \cdot \frac{d}{dx}\left(5x^2 + 3\right)$
- **C.** $\frac{dy}{dx} = \frac{d}{dx}\left(5x^2 + 3\right) \cdot \frac{d}{dx}(3x - 5) + \frac{d}{dx}(3x - 5) \cdot \frac{d}{dx}\left(5x^2 + 3\right)$
- **D.** $\frac{dy}{dx} = \frac{d}{dx}\left(5x^2 + 3\right) \cdot \frac{d}{dx}(3x - 5)$

$\frac{dy}{dx} =$ ______

36. Use the product rule to find the derivative.

$$y = (4x^2 + 5)(4x - 3)$$

$y' =$ ______

37. Differentiate.

$F(x) = (7x + 6)^2$

$F'(x) =$ ______

38. Use the product rule to find the derivative of the following. (Hint: Write the quantity as a product.)

$k(t) = \left(t^2 - 4\right)^2$

$k'(t) =$ ______

39. Use the quotient rule to find the derivative of the function.

$$f(x) = \frac{4x+9}{7x+6}$$

What is the correct way of writing the derivative of y?

- A. $f'(x) = \dfrac{\frac{d}{dx}(7x+6) \cdot \frac{d}{dx}(4x+9)}{[(7x+6)]^2}$
- B. $f'(x) = \dfrac{\frac{d}{dx}(4x+9)}{\frac{d}{dx}(7x+6)}$
- C. $f'(x) = \dfrac{(7x+6) \cdot \frac{d}{dx}(4x+9) - (4x+9) \cdot \frac{d}{dx}(7x+6)}{[(7x+6)]^2}$
- D. $f'(x) = \dfrac{\frac{d}{dx}(7x+6) \cdot \frac{d}{dx}(4x+9) - \frac{d}{dx}(4x+9) \cdot \frac{d}{dx}(7x+6)}{[(7x+6)]^2}$

$f'(x) =$ ______

40. Find the derivative of the function.

$$y = \frac{9x-4}{2x+1}$$

The derivative is $y' =$ ______.

41. Use the quotient rule to find the derivative of the function.

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

$\dfrac{dy}{dx} =$ ______

42. Use the quotient rule to find the derivative of the following.

$$y = \frac{x^2-6x+5}{x^2+7}$$

$\dfrac{dy}{dx} =$ ______

43. Find an equation of the line tangent to the graph of $f(x) = (2x-3)(x+4)$ at (2,6).

The equation of the line tangent to the graph of $f(x) = (2x-3)(x+4)$ at (2,6) is ______.
(Type an equation.)

44. The total cost (in hundreds of dollars) to produce x units of a product is $C(x) = \frac{5x-4}{3x+7}$. Find the average cost for each of the following production levels.
a. 35 units
b. x units
c. Find the marginal average cost function.

The average cost for 35 units is $ ______ per unit.
(Round to the nearest hundredth as needed.)

The average cost for x units is ______ hundred dollars per unit.

The marginal average cost function is $\overline{C}'(x) =$ ______.

45. Suppose that the average cost function is given by $\overline{C}(x) = \frac{C(x)}{x}$, where x is the number of items produced. Show that the marginal average cost function is given by the following.

$$\overline{C}'(x) = \frac{xC'(x) - C(x)}{x^2}$$

In order to find the derivative of an equation of the form $f(x) = \frac{u(x)}{v(x)}$, use the quotient rule. What is the quotient rule?

- **A.** $f'(x) = \frac{v(x) \cdot u'(x) - u(x) \cdot v'(x)}{[v'(x)]^2}$
- **B.** $f'(x) = \frac{v(x) \cdot u'(x) - u(x) \cdot v'(x)}{[v(x)]^2}$
- **C.** $f'(x) = \frac{u(x) \cdot v'(x) - v(x) \cdot u'(x)}{[v'(x)]^2}$

Let u(x) = C(x) and let v(x) = x. Find the derivative of u(x).

- **A.** $u'(x) = C'(x)$
- **B.** $u'(x) = C(x) \cdot C'(x)$
- **C.** $u'(x) = \frac{1}{C'(x)}$

Now find the derivative of v(x).

$v'(x) =$ ______

Substitute the corresponding values into the formula for the quotient rule. What is the result?

- **A.** $\overline{C}'(x) = \frac{xC'(x) - C(x)}{x^2}$
- **B.** $\overline{C}'(x) = \frac{C'(x) - xC(x)}{x^2}$
- **C.** $\overline{C}'(x) = \frac{C'(x) - xC(x)}{[C(x)]^2}$

46. Find the derivative of the function.

$$y = \left(8x^4 - 7x^2 + 6\right)^4$$

To find $\frac{dy}{dx}$, write y as a function of u so that y = f(u) and u = g(x). What is u = g(x) in this case?

g(x) = ______

$\frac{dy}{dx}$ = ______

47. Find the derivative of the function.

$$y = \left(3x^4 - 2x^2 + 5\right)^4$$

$\frac{dy}{dx}$ = ______

(Type an expression using x as the variable.)

48. Find the derivative of the function.

$$y = -3\left(2x^2 + 7\right)^{-6}$$

$\frac{dy}{dx}$ = ______

(Type an expression using x as the variable.)

49. Find the derivative of the function.

$$s(t) = 46\left(6t^3 - 5\right)^{\frac{6}{5}}$$

$s'(t)$ = ______

50. Find the derivative.

$$f(x) = 8\sqrt{4x^2 + 5}$$

$f'(x)$ = ______

51. Find the derivative of the following function.

$$m(t) = -6t\left(2t^3 - 1\right)^5$$

$m'(t)$ = ______

52. Find the derivative of the function $y = (3x + 1)^5(5x + 1)^{-4}$.

$\frac{dy}{dx}$ = ______

53. Find the derivative of the function.

$q(y) = 3y^2 \left(2y^2 + 5\right)^{\frac{4}{3}}$

$q'(y) =$ ☐

54. Find the equation of the tangent line to the graph of the given function at the given value of x.

$f(x) = \sqrt{x^2 + 16}$; $x = 3$

y = ☐
(Type an expression using x as the variable.)

55. Find the equation of the tangent line to the graph of the given function at the given value of x.

$f(x) = 2x\left(x^2 - 4x + 5\right)^5$; $x = 2$

y = ☐
(Type an expression using x as the variable.)

56. Find the derivative of y with respect to x if $y = e^{-13x}$.

The derivative of y with respect to x if $y = e^{-13x}$ is ☐.

57. Differentiate the following function.

$f(x) = 5e^{4x}$

$\frac{d}{dx}\left(5e^{4x}\right) =$ ☐

58. Differentiate the following function.

$y = e^{x^4}$

$y' = \frac{d}{dx}(e^{x^4}) =$ ☐

59. Find the derivative of the function.

$y = 5e^{-4x^2}$

$\frac{dy}{dx} =$ ☐

60. Find the derivative of the function.

$y = x^3 e^x$

$y' =$ ☐

61. Find the derivative of the function.

$$y = \left(3x^2 - 6x + 6\right) e^{-5x}$$

Find the rule that should be used first in finding the derivative of the given function and choose the first step in applying the rule.

The (1) ________ should be used first.

$\frac{dy}{dx}$ = (2) ________

$\frac{dy}{dx}$ = ________

(1)
- ○ quotient rule
- ○ product rule
- ○ constant rule
- ○ chain rule

(2)
- ○ $\dfrac{e^{-5x}\frac{d}{dx}\left(3x^2 - 6x + 6\right) - \left(3x^2 - 6x + 6\right)\frac{d}{dx}\left(e^{-5x}\right)}{\left(e^{-5x}\right)^2}$
- ○ $\dfrac{e^{-5x}\frac{d}{dx}\left(3x^2 - 6x + 6\right) + \left(3x^2 - 6x + 6\right)\frac{d}{dx}\left(e^{-5x}\right)}{\left(e^{-5x}\right)^2}$
- ○ $\left(3x^2 - 6x + 6\right)\frac{d}{dx}\left(e^{-5x}\right) + e^{-5x}\frac{d}{dx}\left(3x^2 - 6x + 6\right)$
- ○ $\left(3x^2 - 6x + 6\right)\frac{d}{dx}\left(e^{-5x}\right) - e^{-5x}\frac{d}{dx}\left(3x^2 - 6x + 6\right)$

62. Find the derivative of the following function.

$$y = \frac{-9e^{5x}}{2x - 3}$$

$y'(x)$ = ________

63. Find derivative of the function.

$$y = \frac{e^{7x} + e^{-7x}}{x}$$

Find the rule that should be used first in finding the derivative of the given function and choose the first step in applying the rule.

The (1) ______ should be used first.

$\frac{dy}{dx}$ = (2) ______

$\frac{dy}{dx}$ = ______

(1)
- product rule
- chain rule
- quotient rule
- constant rule

(2)
- $\dfrac{x \cdot \frac{d}{dx}\left(e^{7x} - e^{-7x}\right) + \left(e^{7x} + e^{-7x}\right) \cdot \frac{d}{dx}(x)}{x^2}$
- $\dfrac{x \cdot \frac{d}{dx}\left(e^{7x} + e^{-7x}\right) - \left(e^{7x} + e^{-7x}\right) \cdot \frac{d}{dx}(x)}{x^2}$
- $x \cdot \frac{d}{dx}\left(e^{7x} + e^{-7x}\right) - \left(e^{7x} + e^{-7x}\right) \cdot \frac{d}{dx}(x)$
- $x \cdot \frac{d}{dx}\left(e^{7x} + e^{-7x}\right) + \left(e^{7x} + e^{-7x}\right) \cdot \frac{d}{dx}(x)$

64. Find the derivative of the given function.

$$y = \frac{425}{42 + 4e^{-2x}}$$

$y' =$ ______
(Type an exact answer.)

65. Find the derivative of the following function.

$$y = 10^{5x+3}$$

$\frac{dy}{dx}$ = ______

66. Find the derivative of the following function.

$$y = 5 \cdot 9^{\sqrt{x-10}}$$

$\frac{dy}{dx}$ = ______

67. Find the derivative of the following function.

$$y = e^{x\sqrt{9x+17}}$$

$\frac{dy}{dx} =$ ☐

68. The sales of a new high-tech item (in thousands) are given by

$$S(t) = 109 - 100e^{-0.3t}$$

where t represents time in years. Find the rate of change of sales at each time.
a.) After 1 year. b.) After 5 years. c.) What is happening to the rate of change of sales as time goes on? d.) Does the rate of change of sales ever equal zero?

a. The rate of change after 1 year is ☐.
(Round to three decimal places as needed.)

b. The rate of change after 5 years is ☐.
(Round to three decimal places as needed.)

c. What is happening to the rate of change of sales as time goes on?

- **A.** First it increases, then it decreases.
- **B.** It always increases.
- **C.** It always decreases.
- **D.** First it decreases, then it increases.

d. Does the rate of change of sales ever equal zero?

- Yes
- No

69. Find the derivative of the following function.

$$f(x) = \ln(14x)$$

Which property of logarithms can be used to simplify the given function in order to get an equivalent form involving the term **ln** x?

- **A.** $\log_a xy = \log_a x + \log_a y$
- **B.** $\log_a a^r = r$
- **C.** $\log_a x^r = r\log_a x$
- **D.** $\log_a x = \frac{\log_b x}{\log_b a}$

Use the property found in the previous step to express **ln** (14x) in terms of **ln** x.

$\ln(14x) =$ ☐

Find the derivative.

$f'(x) =$ ☐

70. Find the derivative.

$y = \ln(5 - 4x)$

$y' =$ [ ]

71. Differentiate.

$y = \ln\left|7x^2 - 5x\right|$

$\frac{dy}{dx} =$ [ ]

72. Find the derivative.

$y = \ln\sqrt{x+6}$

$y' =$ [ ]

73. Find the derivative of the function.

$y = \ln\left(6x^6 + 5x\right)^{5/3}$

$y' =$ [ ]

74. Find the derivative of the function.

$y = -9x\ln(7x + 5)$

$\frac{dy}{dx} =$ [ ]

75. Find the derivative of the following function.

$s = t^{20}\ln|t|$

Which rule of differentiation will be most helpful in beginning this problem?

- **A.** The chain rule
- **B.** The product rule
- **C.** The constant rule
- **D.** The power rule
- **E.** The sum or difference rule

The expression $\ln|t|$ appears as a subexpression of the given function. What is the derivative of this expression?

$\frac{d}{dt}(\ln|t|) =$ [ ]

Find the derivative of the given function.

$\frac{ds}{dt} =$ [ ]

76. Find the derivative of the following function.

$$y = \frac{5 \ln(x+9)}{x^2}$$

Which rule of differentiation will be most helpful in beginning this problem?

- **A.** The power rule
- **B.** The chain rule
- **C.** The sum or difference rule
- **D.** The quotient rule

What is the derivative of $\ln(x+9)$?

$\frac{d}{dx}[\ln(x+9)] =$ ______

Find the derivative of the given function.

$y' =$ ______

77. Find the derivative.

$$y = \frac{6 \ln(x+7)}{x^2}$$

$y' =$ ______

78. Find the derivative of the function $y = \frac{3 \ln 4x}{2 + 5x}$.

$y' =$ ______

79. Find the derivative of the following function.

$$y = \frac{2x^4}{\ln x}$$

$y' =$ ______

80. Find the derivative of the following function.

$$y = (\ln |x+5|)^4$$

$\frac{dy}{dx} =$ ______

81. Differentiate.

$$f(x) = \ln |\ln(3x)|$$

$f'(x) =$ ______

82. Find the derivative of the function.

$$y = e^{7x-1} \ln(7x-1)$$

$\frac{dy}{dx} = $ ______
(Type an exact answer in terms of e.)

83. Find the derivative.

$y = \log(9x)$

$y' = $ ______

84. Find the derivative of the function.

$$y = \log|5-x|$$

$\frac{dy}{dx} = $ ______

85. Find the derivative of the function.

$$y = \log_5 \sqrt{7x+3}$$

$\frac{dy}{dx} = $ ______

86. Find the derivative of the function.

$$y = \log_7 \left(x^2+2x\right)^{\frac{7}{2}}$$

$\frac{dy}{dx} = $ ______

87. Find the derivative of the following function.

$$w = \log_7 \left(3^p - 1\right)$$

$\frac{dw}{dp} = $ ______

88. Find the derivative.

$y = 3^x \log_3 x$

$y' = $ ______

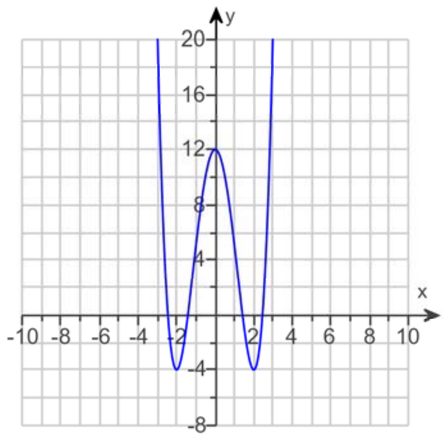
89. Find the derivative.

$f(x) = \ln\left(x e^{\sqrt{x}} + 5\right)$

$f'(x) = $ ______

90.

Find the open intervals where the function graphed below is **(a)** increasing, or **(b)** decreasing.



(a) List the interval(s) where the function is increasing. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

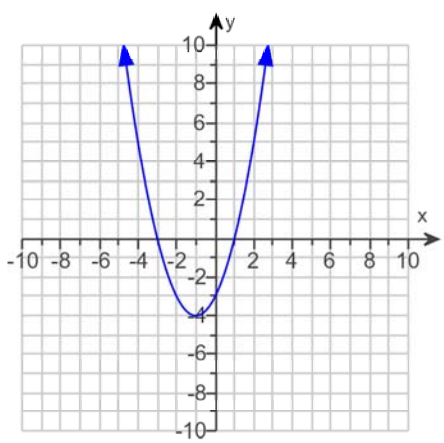
- **A.** Increasing on __________
  (Type your answer in interval notation. Simplify your answer. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- **B.** Never increasing

(b) List the interval(s) where the function is decreasing. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** Decreasing on __________
  (Type your answer in interval notation. Simplify your answer. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- **B.** Never decreasing

91.

Suppose that the graph below is the graph of $f'(x)$, the derivative of a function $f(x)$. Find the open intervals where $f(x)$ is **a)** increasing, or **b)** decreasing.



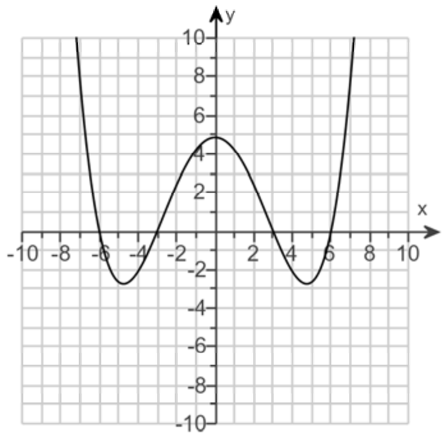
a) List any interval(s) on which the function is increasing. Select the correct choice below and fill in any answer boxes within your choice.

- **A.** __________
  (Type your answer in interval notation. Use a comma to separate answers as needed.)
- **B.** The function is never increasing.

b) List any interval(s) on which the function is decreasing. Select the correct choice below and fill in any answer boxes within your choice.

- **A.** __________
  (Type your answer in interval notation. Use a comma to separate answers as needed.)
- **B.** The function is never decreasing.

92. Suppose that the graph below is the graph of $f'(x)$, the derivative of a function $f(x)$. Find the open intervals where $f(x)$ is **a)** increasing, or **b)** decreasing.



a) List any interval(s) on which the function is increasing. Select the correct choice below and fill in any answer boxes within your choice.

○ **A.** ______
(Type your answer in interval notation. Use a comma to separate answers as needed.)

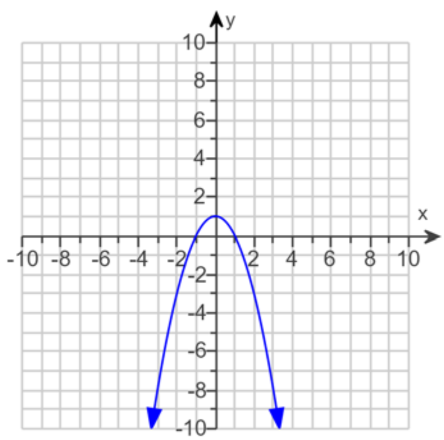
○ **B.** The function is never increasing.

b) List any interval(s) on which the function is decreasing. Select the correct choice below and fill in any answer boxes within your choice.

○ **A.** ______
(Type your answer in interval notation. Use a comma to separate answers as needed.)

○ **B.** The function is never decreasing.

93. Find the locations and values of all relative extrema for the function with the graph below.

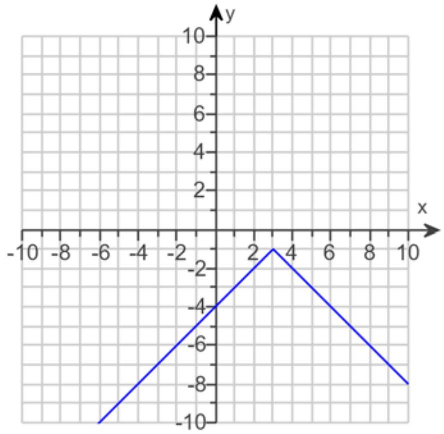


The function has a local (1) ______ of ______ at x = ______.

(1) ○ minimum
○ maximum

94.

Find the locations and values of all relative extrema for the function with the graph below.

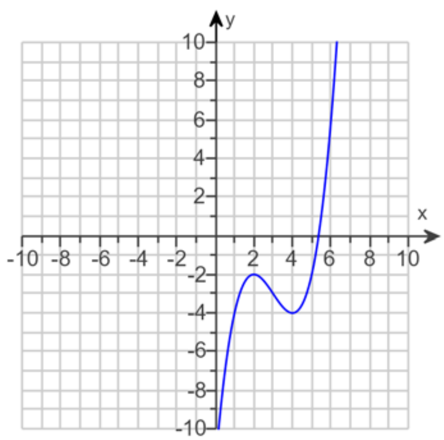


(1) ○ minimum
○ maximum

The function has a local (1) ________ of ________ at x = ________.

95.

Find the locations and values of all relative extrema for the function with the graph below.



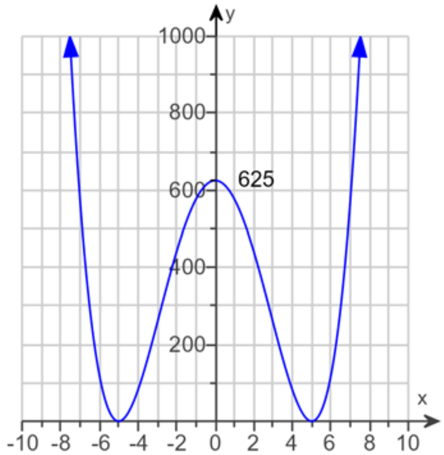
(1) ○ minimum
○ maximum

(2) ○ minimum
○ maximum

The function has a local (1) ________ of − 2 at x = ________.

The function has a local (2) ________ of − 4 at x = ________.

96. Find the locations and values of all relative extrema for the function with the graph below.



(1) relative minimum / relative maximum

(2) relative minimum / relative maximum

The function has a (1) ______ of 0 at x = ______.
(Use a comma to separate answers as needed.)

The function has a (2) ______ of 625 at x = ______.
(Use a comma to separate answers as needed.)

97. Find the x-values of all points where the function has any relative extrema. Find the value(s) of any relative extrema.

$f(x) = 2x + 4 \ln x$

First find the derivative of f(x).

$f'(x) =$ ______

Now find any critical numbers of f(x).

- **A.** The critical number(s) is/are ______.
  (Use a comma to separate answers as needed.)
- **B.** There are no critical numbers of f(x).

Select the correct choice below and, if necessary, fill in any answer boxes within your choice.

- **A.** There are no relative minima. The function has a relative maximum of ______ at x = ______.
  (Use a comma to separate answers as needed.)
- **B.** There are no relative maxima. The function has a relative minimum of ______ at x = ______.
  (Use a comma to separate answers as needed.)
- **C.** The function has a relative maximum of ______ at x = ______ and a relative minimum of ______ at x = ______.
  (Use a comma to separate answers as needed.)
- **D.** There are no relative extrema.

98. Use the derivative to find the vertex of the parabola.

$y = -2x^2 - 4x + 5$

Let f(x) = y. Find the derivative of f(x).

$f'(x) =$ ______

The vertex is ______.
(Type an ordered pair.)

99. Use the derivative to find the vertex of the parabola.

$y = -x^2 + 4x + 2$

The vertex is ______.
(Type an ordered pair.)

100. For the function $f(x) = 7x^3 - 6x^2 + 13x + 8$, find $f''(x)$. Then find $f''(0)$ and $f''(3)$.

$f''(x) =$ ______

Select the correct choice below and fill in any answer boxes in your choice.

- **A.** $f''(0) =$ ______ (Simplify your answer.)
- **B.** $f''(0)$ is undefined.

Select the correct choice below and fill in any answer boxes in your choice.

- **A.** $f''(3) =$ ______ (Simplify your answer.)
- **B.** $f''(3)$ is undefined.

101. For the function $f(x) = 8x^2 - 5x + 6$, find $f''(x)$. Then find $f''(0)$ and $f''(4)$.

$f''(x) =$ ______ (Simplify your answer.)

Select the correct choice below and fill in any answer boxes in your choice.

- **A.** $f''(0) =$ ______ (Simplify your answer.)
- **B.** $f''(0)$ is undefined.

Select the correct choice below and fill in any answer boxes in your choice.

- **A.** $f''(4) =$ ______ (Simplify your answer.)
- **B.** $f''(4)$ is undefined.

102. For the function $f(x) = \frac{x^2}{5+x}$, find $f''(x)$. Then find $f''(0)$ and $f''(5)$.

$f''(x) =$ ______

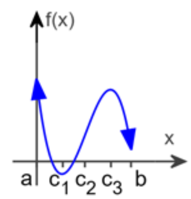
Select the correct choice below and fill in any answer boxes in your choice.

- **A.** $f''(0) =$ ______ (Simplify your answer. Type an exact answer.)
- **B.** $f''(0)$ is undefined.

Select the correct choice below and fill in any answer boxes in your choice.

- **A.** $f''(5) =$ ______ (Simplify your answer. Type an exact answer.)
- **B.** $f''(5)$ is undefined.

103. Find the locations of any absolute extrema for the function whose graph is shown to the right.



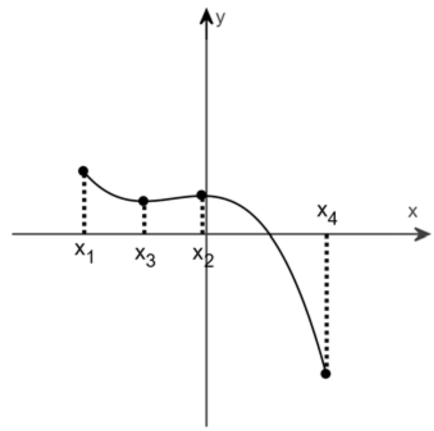
At what x-coordinate, if any, does an absolute maximum occur?

- **A.** No absolute maximum occurs.
- **B.** c_2
- **C.** c_1
- **D.** a
- **E.** c_3

At what x-coordinate, if any, does an absolute minimum occur?

- **A.** b
- **B.** c_1
- **C.** No absolute minimum occurs.
- **D.** c_3
- **E.** c_2

104. Identify each labeled x-coordinate as the location of an absolute maximum, absolute minimum, or neither.



(1) ______ occurs at x_1.

(2) ______ occurs at x_2.

(3) ______ occurs at x_3.

(4) ______ occurs at x_4.

(1)
- An absolute maximum
- An absolute minimum
- Neither absolute extremum

(2)
- An absolute maximum
- An absolute minimum
- Neither absolute extremum

(3)
- An absolute maximum
- An absolute minimum
- Neither absolute extremum

(4)
- An absolute maximum
- An absolute minimum
- Neither absolute extremum

105. Find the absolute maximum and minimum values of each function over the indicated interval, and indicate the x-values at which they occur.

$f(x) = 2x^3 - x^2 - 4x + 8; [-1,0]$

The absolute maximum value is ______ at x = ______.
(Use a comma to separate answers as needed. Type an integer or a fraction.)

The absolute minimum value is ______ at x = ______.
(Use a comma to separate answers as needed. Type an integer or a fraction.)

106. Follow the steps below to find the nonnegative numbers x and y that satisfy the given requirements. Give the optimum value of the indicated expression. Complete parts (a) through (f) below.

$x + y = 210$ and the product $P = xy$ as large as possible.

(a) Solve $x + y = 210$ for y.

[ ] (Type an equation.)

(b) Substitute the result from part (a) into $P = xy$, the equation for the variable that is to be maximized.

[ ] (Type an equation.)

(c) Find the domain of P found in part (b).

[ ] (Type your answer in interval notation.)

(d) Find $\frac{dP}{dx}$. Solve the equation $\frac{dP}{dx} = 0$.

$\frac{dP}{dx} =$ [ ] and when $\frac{dP}{dx} = 0$, $x =$ [ ] (Use a comma to separate answers as needed.)

(e) Evaluate P at any solutions found in part (d), as well as at the endpoints of the domain found in part (c).

To answer the first part, select the correct choice below and, if necessary, fill in the answer box(es) within your choice.

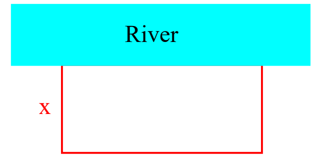
- **A.** There was one solution in part (d). For that solution, $P =$ ______.
- **B.** There were two solutions in part (d). For the lesser value of x, $P =$ ______. For the greater value of x, $P =$ ______.

Evaluate P at the endpoints of the domain. At the lower endpoint, $P =$ [ ]. At the upper endpoint, $P =$ [ ]

(f) Give the maximum value of P, as well as the two numbers, x and y, whose product is that value.

$P =$ [ ] when $x =$ [ ] and $y =$ [ ].

107. A campground owner has 2400 m of fencing. He wants to enclose a rectangular field bordering a river, with no fencing along the river. (See the sketch.) Let x represent the width of the field.



(a) Write an expression for the length of the field as a function of x.
(b) Find the area of the field (area = length × width) as a function of x.
(c) Find the value of x leading to the maximum area.
(d) Find the maximum area.

(a) $\ell(x) =$ ____

(b) $A(x) =$ ____

(c) First write the expression for the derivative used to find the x value that maximizes area.

$\frac{dA}{dx} =$ ____

The x-value leading to the maximum area is ____ (1) ____

(d) The maximum area of the rectangular plot is ____ (2) ____

(1) ○ m. ○ m^3. ○ m^2.

(2) ○ m. ○ m^2. ○ m^3.

108. A local club is arranging a charter flight to Hawaii. The cost of the trip is $540 each for 82 passengers, with a refund of $5 per passenger for each passenger in excess of 82.
a. Find the number of passengers that will maximize the revenue received from the flight.
b. Find the maximum revenue.

a. The number of passengers that will maximize the revenue received from the flight is ____.
(Round to the nearest integer as needed.)

b. The maximum revenue is $____.

109. A local group of scouts has been collecting aluminum cans for recycling. The group has already collected 5200 lb of cans, for which they could currently receive $4.05 per hundred pounds. The group can continue to collect cans at the rate of 400 lb per day. However, a glut in the aluminum market has caused the recycling company to announce that it will lower its price, starting immediately, by $0.15 per hundred pounds per day. The scouts can make only one trip to the recycling center. Find the best time for the trip. What total income will be received?

Write the equation for the income, I, the scouts will receive in dollars after t days.

$I(t) =$ ____

The best time for the trip is in ____ days, when the scouts can receive an income of $____.

110. Suppose that x and y are related by the equation $2x^2 - 3y^2 = 1$ and use implicit differentiation to determine $\frac{dy}{dx}$.

$\frac{dy}{dx} =$ ____

111. Find $\frac{dy}{dx}$ by implicit differentiation.

$8x^2 - 5xy + 2y^2 = 43$

Write the results of differentiating with respect to x and using the chain rule and the product rule on each side of the equation.

(1) ______ = 0

Find $\frac{dy}{dx}$.

$\frac{dy}{dx}$ = ______

(1)
- ○ $16x - 5x\frac{dy}{dx} - 5y + 4y\frac{dy}{dx}$
- ○ $16x\frac{dy}{dx} - 5x - 5y\frac{dy}{dx} + 4y\frac{dy}{dx}$
- ○ $16x - 5x\frac{dy}{dx} - 5y + \frac{dy}{dx}$
- ○ $8\frac{dy}{dx} - 5x - 5y\frac{dy}{dx} + 4y\frac{dy}{dx}$
- ○ $16x\frac{dy}{dx} - 5x\frac{dy}{dx} - 5y + 4\frac{dy}{dx}$

112. Differentiate implicitly to find $\frac{dy}{dx}$.

$5x^2 + 3xy + 8y^2 + 14y - 5 = 0$

$\frac{dy}{dx}$ = ______

113. Differentiate implicitly to find $\frac{dy}{dx}$.

$$e^{x^2y} = 5x + 7y + 9$$

Evaluate the derivative of the each side of the given equation using the chain rule as needed.

$\frac{d}{dx}\left(e^{x^2y}\right) = $ (1) _____

$\frac{d}{dx}(5x + 7y + 9) = $ _____

Find $\frac{dy}{dx}$.

$\frac{dy}{dx} = $ _____

(1)
- ○ $e^{x^2y}\left(2x\frac{dy}{dx}\right)$
- ○ $e^{x^2y}\left(2xy\frac{dy}{dx} + x^2\right)$
- ○ $e^{x^2y}\left(2xy + x^2\frac{dy}{dx}\right)$
- ○ $e^{x^2y}\left(2xy\frac{dy}{dx}\right)$
- ○ $e^{x^2y}\left(2x\frac{dy}{dx} + x^2\right)$

114. Find the equation of the tangent line at the given point on the following curve.

$$x^2 + y^2 = 8, \ (-2,2)$$

The equation of the tangent line to the point $(-2,2)$ is $y = $ _____.

115. Evaluate the following indefinite integral.

$$\int 9\ dx$$

$\int 9\ dx = $ _____ (Use C as the arbitrary constant.)

116. Find the indefinite integral $\int (14x + 5)dx$.

$\int (14x + 5)dx = $ _____

(Use C as an arbitrary constant.)

117. Evaluate.

$$\int \left(12x^2 - 7x + 4\right)\ dx$$

$\int \left(12x^2 - 7x + 4\right)\ dx = $ _____ (Use C as the arbitrary constant.)

118. Find the following.

$$\int \left(13\sqrt{x} + \sqrt{7}\right)\, dx$$

$\int \left(13\sqrt{x} + \sqrt{7}\right)\, dx =$ ☐ (Use C as the arbitrary constant.)

119. Evaluate the following integral.

$$\int 4x^2\left(x^3 + 8\right)\, dx$$

$\int 4x^2\left(x^3 + 8\right)\, dx =$ ☐

(Use C as the arbitrary constant.)

120. Find the following.

$$\int \left(6\sqrt[7]{x} - 10x^{\frac{2}{5}}\right)\, dx$$

$\int \left(6\sqrt[7]{x} - 10x^{\frac{2}{5}}\right)\, dx =$ ☐

(Use C as the arbitrary constant.)

121. Evaluate the following indefinite integral.

$$\int \frac{2}{x^2}\, dx$$

$\int \frac{2}{x^2}\, dx =$ ☐ (Use C as the arbitrary constant.)

122. Evaluate the following indefinite integral.

$$\int \left(\frac{\sqrt{\pi}}{x^5} + \pi\sqrt{x}\right)\, dx$$

$\int \left(\frac{\sqrt{\pi}}{x^5} + \pi\sqrt{x}\right)\, dx =$ ☐

(Use C as the arbitrary constant.)

123. Evaluate the following indefinite integral.

$$\int \frac{1}{2x^3}\, dx$$

$\int \frac{1}{2x^3}\, dx =$ ☐

(Use C as the arbitrary constant.)

124. Determine the following.

$$\int 7e^{-0.5x}\,dx$$

$\int 7e^{-0.5x}\,dx =$ ____

(Use C as the arbitrary constant.)

125. Evaluate.

$$\int \left(\frac{6}{x} - 9e^{2x} + e^{0.1}\right) dx$$

$\int \left(\frac{6}{x} - 9e^{2x} + e^{0.1}\right) dx =$ ____

(Use C as the arbitrary constant.)

126. Evaluate the following indefinite integral.

$$\int \frac{1 + 9t^5}{8t}\,dt$$

$\int \frac{1 + 9t^5}{8t}\,dt =$ ____

(Use C as the arbitrary constant.)

127. Evaluate.

$$\int \left(e^{12u} + 8u\right) du$$

$\int \left(e^{12u} + 8u\right) du =$ ____

(Use C as the arbitrary constant.)

128. Find $\int (6x+5)^2\,dx$.

$\int (6x+5)^2\,dx =$ ____

(Use C as the arbitrary constant.)

129. Find the indefinite integral.

$$\int \frac{\sqrt{x} + 4}{\sqrt[3]{x}}\,dx$$

$\int \frac{\sqrt{x} + 4}{\sqrt[3]{x}}\,dx =$ ____

(Use C as the arbitrary constant.)

130. Evaluate the integral $\int 15^x dx$.

$\int 15^x dx =$ ______
(Use C as the arbitrary constant.)

131. Find an equation of the curve whose tangent line has a slope of $f'(x) = x^{\frac{7}{8}}$ given that the point $\left(1, \frac{8}{15}\right)$ is on the curve.

Set up the integral needed to find the equation of the curve.

$\int$ ______ dx

The equation of the curve whose tangent line has a slope of $f'(x) = x^{\frac{7}{8}}$ given that the point $\left(1, \frac{8}{15}\right)$ is on the curve is f(x) = ______

132. Find the cost function if the marginal cost function is given by $C'(x) = x^{3/4} + 8$ and 81 units cost $1,957.

C(x) = ______

133. Find the demand function for the marginal revenue function. Recall that if no items are sold, the revenue is 0.

$R'(x) = 0.03x^2 - 0.04x + 129$

p(x) = ______

134. Find the demand function for the marginal revenue function. Recall that if no items are sold, the revenue is 0.

$R'(x) = 473 - 0.21\sqrt{x}$

Write the integral that is needed to solve the problem.

$\int$ (______) dx

The demand function for the marginal revenue function $R'(x) = 473 - 0.21\sqrt{x}$ is p = ______.

135. Under certain conditions, the number of diseased cells N(t) at time t increases at a rate $N'(t) = Ae^{kt}$, where A is the rate of increase at time 0 (in cells per day) and k is a constant.

a. Suppose A = 50, and at 5 days, the cells are growing at a rate of 250 per day. Find a formula for the number of cells after t days, given that 300 cells are present at t = 0.

b. Use your answer from part a to find the number of cells present after 11 days.

a. Find a formula for the number of cells, N(t), after t days.

N(t) = ______
(Round any numbers in exponents to five decimal places. Round all other numbers to the nearest tenth.)

b. After 11 days, there are ______ cells present.
(Use the answer from part a to find this answer. Round to the nearest whole number as needed.)

136. Suppose $a(t) = (45/2)\sqrt{t} + 4e^{-t}$, $v(0) = -4$, and $s(0) = 6$. Find s(t).

$s(t) =$ [ ]

---

137. Use substitution to find the indefinite integral $\int \frac{12}{(4x-5)^4}dx$.

$\int \frac{12}{(4x-5)^4}dx =$ [ ]

(Use C as an arbitrary constant.)

---

138. Use substitution to find the indefinite integral.

$$\int \frac{5x+7}{\left(5x^2+14x\right)^3}dx$$

$\int \frac{5x+7}{\left(5x^2+14x\right)^3}dx =$ [ ]

(Use C as the arbitrary constant.)

---

139. Use substitution to find the indefinite integral.

$$\int 9x^8 e^{9x^9} dx$$

$\int 9x^8 e^{9x^9} dx =$ [ ] (Use C as the arbitrary constant.)

---

140. Use substitution to find the indefinite integral.

$$\int (1-t) e^{16t-8t^2} dt$$

Describe the most appropriate substitution case and the values of u and du. Select the correct choice below and fill in the answer boxes within your choice.

- **A.** Substitute u for the exponent on e. Let u = ____, so that du = (____) dt.
- **B.** Substitute u for the quantity in the denominator. Let u = ____, so that du = (____) dt.
- **C.** Substitute u for the quantity under a root or raised to a power. Let u = ____, so that du = (____) dt

$\int (1-t) e^{16t-8t^2} dt =$ [ ] (Use C as the arbitrary constant.)

141. Evaluate the integral.

$$\int \frac{e^{5\sqrt{s}}}{\sqrt{s}}\, ds$$

$\int \frac{e^{5\sqrt{s}}}{\sqrt{s}}\, ds =$ ______

(Use C as the arbitrary constant.)

142. Find the indefinite integral.

$$\int \frac{x}{\sqrt{x-1}}\, dx$$

$\int \frac{x}{\sqrt{x-1}}\, dx =$ ______

(Use C as the arbitrary constant.)

143. Find the indefinite integral.

$$\int \frac{(1+5\ln x)^{10}}{x}\, dx$$

$\int \frac{(1+5\ln x)^{10}}{x}\, dx =$ ______

(Use C as the arbitrary constant. Use integers or fractions for any numbers in the expression.)

144. Evaluate the integral.

$$\int \frac{9e^{9y}}{1+e^{9y}}\, dy$$

$\int \frac{9e^{9y}}{1+e^{9y}}\, dy =$ ______ (Use C as the arbitrary constant.)

145. Determine the indefinite integral.

$$\int \frac{27}{x\ln 5x}\, dx$$

$\int \frac{27}{x\ln 5x}\, dx =$ ______

(Use C as the arbitrary constant.)

146. The marginal revenue (in thousands of dollars) from the sale of x gadgets is given by the following function.

$$R'(x) = 4x\left(x^2 + 30{,}000\right)^{-\frac{2}{3}}$$

a. Find the total revenue function if the revenue from 130 gadgets is $66,376.
b. How many gadgets must be sold for a revenue of at least $45,000?

a. The total revenue function is R(x) = [ ], given that the revenue from 130 gadgets is $66,376.
(Round to the nearest integer as needed.)

b. [ ] gadgets must be sold to generate a revenue of at least $45,000.
(Type a whole number.)

147. Approximate the area under the graph of f(x) and above the x-axis with rectangles, using the following methods with n = 4.

$f(x) = -x^2 + 10$ from $x = -2$ to $x = 2$

(a) Use left endpoints.
(b) Use right endpoints.
(c) Average the answers in parts (a) and (b)
(d) Use midpoints.

(a) The area, approximated using the left endpoints, is [ ].

(b) The area, approximated using the right endpoints, is [ ].

(c) The average of the answers in parts (a) and (b) is [ ].

(d) The area, approximated using the midpoints, is [ ].

148. Consider the region below $f(x) = (9 - x)$, above the x-axis, and between $x = 0$ and $x = 9$. Let x_i be the midpoint of the ith subinterval. Complete parts **a.** and **b.** below.

a. Approximate the area of the region using nine rectangles. Use the midpoints of each subinterval for the heights of the rectangles.

The area is approximately [ ] square units. (Type an integer or decimal.)

b. Find $\int_0^9 (9 - x)\,dx$ by using the formula for the area of a triangle.

$\int_0^9 (9 - x)\,dx =$ [ ] (Simplify your answer.)

149. Find the exact value of the integral using formulas from geometry.

$$\int_1^3 (1 + 2x)dx$$

$\int_1^3 (1 + 2x)dx =$ [ ] (Simplify your answer.)

1. 43,805.37

---

2. 42.3

---

3. A. $\lim_{x \to \infty} f(x) =$ **1.25**

---

4. (1) =

(2) exists.

(3) ≠

(4) does not exist.

---

5. A. $\lim_{x \to 6} f(x) =$ **9**

---

6. 73.510

74.850

74.985

75.015

75.150

76.510

A. $\lim_{x \to 5} \frac{x^3 - 125}{x - 5} =$ **75**

---

7. − 46.2679

− 464.3861

− 4645.5623

4645.9403

464.7640

46.6458

B. The limit does not exist and is neither ∞ nor − ∞.

---

8. 25 − 23

2

---

9. A. $\lim_{x \to 9} \dfrac{x^2 - 2x - 63}{x - 9} =$ **16** (Simplify your answer.)

---

10. A. $\lim_{h \to 0} \dfrac{\frac{6}{7+h} - \frac{6}{7}}{h} =$ $\mathbf{-\frac{6}{49}}$

---

11. A. $\lim_{x \to 16} \dfrac{\sqrt{x} - 4}{x - 16} =$ $\mathbf{\frac{1}{8}}$ (Type an integer or a simplified fraction.)

---

12. A. $\lim_{x \to \infty} \dfrac{7x}{2x - 1} =$ $\mathbf{\frac{7}{2}}$ (Simplify your answer. Type an integer or a fraction.)

---

13. A. $\lim_{x \to \infty} \dfrac{2x^2 + 2x}{4x^2 - 4x + 1} =$ $\mathbf{\frac{1}{2}}$ (Simplify your answer. Type an integer or a fraction.)

---

14. − 12.100

− 12.010

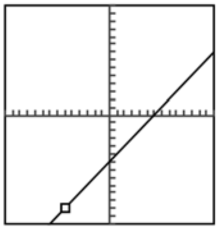
− 12.001

− 11.999

− 11.990

− 11.900

− 12

C. 

---

15. 1.506

1.501

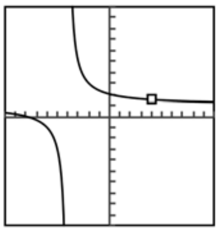
1.500

1.500

1.499

1.494

1.500

D. 

---

16. 8

---

17. C. $\frac{f(2) - f(1)}{2 - 1}$

1

---

18. 1

---

19. 99.0099

---

20. 34

---

21. D. $\frac{L(25) - L(21)}{25 - 21}$

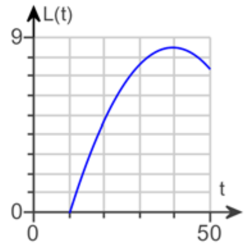
0.328

(1) mm per week.

A. $\lim_{h \to 0} \frac{L(21 + h) - L(21)}{h}$

0.368

(2) mm per week.

C. 

D. No, because the crown length should reach a maximum length and then level off.

C. The first molars have not started growing at this point.

B.
The function does not accurately model crown length during the first 11 weeks because the length will be negative and this is not possible.

---

22. -7

---

23. -4

---

24. 0

---

25. $-2x + 4$

A. $f'(1) =$ **2** (Type an integer or a simplified fraction.)

A. $f'(2) =$ **0** (Type an integer or a simplified fraction.)

A. $f'(3) =$ **-2** (Type an integer or a simplified fraction.)

---

26. $-\frac{16}{x^2}$

A. $f'(-2) =$ **-4**

B. The derivative does not exist.

A. $f'(3) =$ **$-\frac{16}{9}$** (Type an integer or a simplified fraction.)

---

27. $\frac{7}{\sqrt{14x}}$

B. The derivative does not exist.

B. The derivative does not exist.

A. $g'(2) = \frac{7}{2\sqrt{7}}$ (Type an exact answer.)

---

28. $3x^2 - 16x + 5$

---

29. $3x^2 - \frac{x}{14} + 8$

---

30. $26x - 8 + 18x^{-3}$

---

31. $-\frac{63}{x^8} + \frac{9}{x^2}$

---

32. $8x - \frac{18}{x^4}$

---

33. $-\frac{319}{7}$

---

34. C. Substitute 1 for x into the derivative of the function and evaluate.

-2

$y = -2x + 8$

---

35. B. $\frac{dy}{dx} = \left(5x^2 + 3\right) \cdot \frac{d}{dx}(3x - 5) + (3x - 5) \cdot \frac{d}{dx}\left(5x^2 + 3\right)$

$45x^2 - 50x + 9$

---

36. $48x^2 - 24x + 20$

---

37. $98x + 84$

---

38. $4t^3 - 16t$

39.
C. $f'(x) = \dfrac{(7x+6) \cdot \frac{d}{dx}(4x+9) - (4x+9) \cdot \frac{d}{dx}(7x+6)}{[(7x+6)]^2}$

$-\dfrac{39}{(7x+6)^2}$

---

40. $\dfrac{17}{(2x+1)^2}$

---

41. $\dfrac{2x^2 - 8x - 1}{(x-2)^2}$

---

42. $\dfrac{6x^2 + 4x - 42}{\left(x^2+7\right)^2}$

---

43. $y = 13x - 20$

---

44. 4.36

$\dfrac{5x-4}{3x^2+7x}$

$\dfrac{-15x^2 + 24x + 28}{\left(3x^2+7x\right)^2}$

45.
B. $f'(x) = \dfrac{v(x) \cdot u'(x) - u(x) \cdot v'(x)}{[v(x)]^2}$

A. $u'(x) = C'(x)$

1

A. $\overline{C}'(x) = \dfrac{xC'(x) - C(x)}{x^2}$

---

46. $8x^4 - 7x^2 + 6$

$4\left(8x^4 - 7x^2 + 6\right)^3\left(32x^3 - 14x\right)$

---

47. $4\left(3x^4 - 2x^2 + 5\right)^3\left(12x^3 - 4x\right)$

---

48. $72x\left(2x^2+7\right)^{-7}$

---

49. $\dfrac{4968t^2\left(6t^3-5\right)^{\frac{1}{5}}}{5}$

---

50. $\dfrac{32x}{\sqrt{4x^2+5}}$

---

51. $-6\left(2t^3-1\right)^4\left(32t^3-1\right)$

---

52. $\dfrac{(3x+1)^4(15x-5)}{(5x+1)^5}$

---

53. $2y\left(2y^2+5\right)^{\frac{1}{3}}\left(14y^2+15\right)$

---

54. $\dfrac{3}{5}x+\dfrac{16}{5}$

---

55. $2x$

---

56. $-13e^{-13x}$

---

57. $20e^{4x}$

---

58. $e^{x^4}\cdot 4x^3$

---

59. $-40xe^{-4x^2}$

---

60. $3x^2e^x+x^3e^x$

---

61. (1) product rule

(2) $\left(3x^2-6x+6\right)\frac{d}{dx}\left(e^{-5x}\right)+e^{-5x}\frac{d}{dx}\left(3x^2-6x+6\right)$

$3e^{-5x}\left(-5x^2+12x-12\right)$

---

62. $\dfrac{9e^{5x}(-10x+17)}{(2x-3)^2}$

---

63. (1) quotient rule

(2) $\dfrac{x\cdot\frac{d}{dx}\left(e^{7x}+e^{-7x}\right)-\left(e^{7x}+e^{-7x}\right)\cdot\frac{d}{dx}(x)}{x^2}$

$\dfrac{7x\left(e^{7x}-e^{-7x}\right)-\left(e^{7x}+e^{-7x}\right)}{x^2}$

---

64. $\dfrac{3400e^{-2x}}{\left(42+4e^{-2x}\right)^2}$

---

65. $5(\ln 10)10^{5x+3}$

---

66. $5\ln 9\cdot 9^{\sqrt{x-10}}\cdot\dfrac{1}{2\sqrt{x-10}}$

---

67. $e^{x\sqrt{9x+17}}\dfrac{27x+34}{2\sqrt{9x+17}}$

---

68. 22.225

6.694

C. It always decreases.

No

---

69. A. $\log_a xy=\log_a x+\log_a y$

$\ln 14+\ln x$

$\dfrac{1}{x}$

---

70. $-\frac{4}{5-4x}$

---

71. $\frac{14x-5}{7x^2-5x}$

---

72. $\frac{1}{2(x+6)}$

---

73. $\frac{5\left(36x^5+5\right)}{3x\left(6x^5+5\right)}$

---

74. $\frac{-63x}{7x+5} - 9\ \mathbf{ln}\ (7x+5)$

---

75. B. The product rule

$\frac{1}{t}$

$t^{19} + 20t^{19}\ \mathbf{ln}\ |t|$

---

76. D. The quotient rule

$\frac{1}{x+9}$

$\frac{5x-10(x+9)\ \mathbf{ln}\ (x+9)}{x^3(x+9)}$

---

77. $\frac{6x-12(x+7)\ \mathbf{ln}\ (x+7)}{x^3(x+7)}$

---

78. $\frac{3(2+5x-5x\ \mathbf{ln}\ (4x))}{x(2+5x)^2}$

---

79. $\frac{8x^3\ \mathbf{ln}\ x-2x^3}{(\mathbf{ln}\ x)^2}$

---

80. $\frac{4(\mathbf{ln}\ |x+5|)^3}{x+5}$

---

81. $\frac{1}{x \ln (3x)}$

---

82. $\frac{7e^{7x-1}}{7x-1} + 7e^{7x-1} \ln (7x-1)$

---

83. $\frac{1}{(\ln 10)x}$

---

84. $\frac{-1}{\ln 10(5-x)}$

---

85. $\frac{7}{(2 \ln 5)(7x+3)}$

---

86. $\frac{7(x+1)}{(\ln 7)(x)(x+2)}$

---

87. $\frac{(\ln 3)3^p}{(\ln 7)\left(3^p - 1\right)}$

---

88. $\frac{3^x}{(\ln 3)x} + \log_3 x \cdot 3^x \ln 3$

---

89. $\frac{\sqrt{x} \cdot e^{\sqrt{x}} + 2e^{\sqrt{x}}}{2\left(xe^{\sqrt{x}} + 5\right)}$

---

90. A. Increasing on **$(-2,0),(2,\infty)$**

(Type your answer in interval notation. Simplify your answer. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

A. Decreasing on **$(-\infty,-2),(0,2)$**

(Type your answer in interval notation. Simplify your answer. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

---

91. A. **$(-\infty,-3),(1,\infty)$** (Type your answer in interval notation. Use a comma to separate answers as needed.)

A. **$(-3, 1)$** (Type your answer in interval notation. Use a comma to separate answers as needed.)

---

92. A. **$(-\infty,-6),(-3,3),(6,\infty)$** (Type your answer in interval notation. Use a comma to separate answers as needed.)

A. **$(-6,-3),(3,6)$** (Type your answer in interval notation. Use a comma to separate answers as needed.)

---

93. (1) maximum

1

0

---

94. (1) maximum

-1

3

---

95. (1) maximum

2

(2) minimum

4

---

96. (1) relative minimum

$-5,5$

(2) relative maximum

0

---

97. $2+\frac{4}{x}$

B. There are no critical numbers of f(x).

D. There are no relative extrema.

---

98. $-4x-4$

$(-1,7)$

---

99. (2,6)

---

100. $42x-12$

A. $f''(0) =$ **-12** (Simplify your answer.)

A. $f''(3) =$ **114** (Simplify your answer.)

---

101. 16

A. $f''(0) =$ **16** (Simplify your answer.)

A. $f''(4) =$ **16** (Simplify your answer.)

---

102. $\frac{50}{(5+x)^3}$

A. $f''(0) = \frac{2}{5}$ (Simplify your answer. Type an exact answer.)

A. $f''(5) = \frac{1}{20}$ (Simplify your answer. Type an exact answer.)

---

103. A. No absolute maximum occurs.

C. No absolute minimum occurs.

---

104. (1) An absolute maximum

(2) Neither absolute extremum

(3) Neither absolute extremum

(4) An absolute minimum

---

105. $\frac{260}{27}$

$-\frac{2}{3}$

8

0

---

106. $y = 210 - x$

$P = x(210 - x)$

[0,210]

$-2x + 210$

105

A. There was one solution in part (d). For that solution, P = **11,025**.

0

0

11,025

105

105

---

107. $2400 - 2x$

$(2400 - 2x)x$

$-4x + 2400$

600

(1) m.

720,000

(2) m^2.

---

108. 95

45,125

---

109. $-0.6t^2 + 8.4t + 210.6$

7

240

---

110. $\frac{2x}{3y}$

---

111. (1) $16x - 5x\frac{dy}{dx} - 5y + 4y\frac{dy}{dx}$

$\frac{16x - 5y}{5x - 4y}$

---

112. $\dfrac{-10x-3y}{3x+16y+14}$

---

113. (1) $e^{x^2y}\left(2xy+x^2\dfrac{dy}{dx}\right)$

$5+7\dfrac{dy}{dx}$

$\dfrac{2xy\,e^{x^2y}-5}{7-x^2\,e^{x^2y}}$

---

114. $x+4$

---

115. $9x+C$

---

116. $7x^2+5x+C$

---

117. $4x^3-\dfrac{7}{2}x^2+4x+C$

---

118. $\dfrac{26}{3}x^{\frac{3}{2}}+\sqrt{7}\,x+C$

---

119. $\dfrac{2}{3}x^6+\dfrac{32}{3}x^3+C$

---

120. $\dfrac{21}{4}x^{\frac{8}{7}}-\dfrac{50}{7}x^{\frac{7}{5}}+C$

---

121. $-\dfrac{2}{x}+C$

---

122. $-\dfrac{\sqrt{\pi}}{4x^4}+\dfrac{2\pi\sqrt{x^3}}{3}+C$

---

123. $-\dfrac{1}{4x^2}+C$

---

124. $-14e^{-0.5x} + C$

---

125. $6\ln|x| - \frac{9}{2}e^{2x} + e^{0.1}x + C$

---

126. $\frac{1}{8}\ln|t| + \frac{9}{40}t^5 + C$

---

127. $\frac{1}{12}e^{12u} + 4u^2 + C$

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128. $12x^3 + 30x^2 + 25x + C$

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129. $\frac{6}{7}x^{\frac{7}{6}} + 6x^{\frac{2}{3}} + C$

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130. $\frac{15^x}{\ln 15} + C$

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131. $x^{\frac{7}{8}}$

$\frac{8}{15}x^{\frac{15}{8}}$

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132. $\frac{4x^{7/4}}{7} + 8x + \frac{415}{7}$

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133. $0.01x^2 - 0.02x + 129$

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134. $473 - 0.21\sqrt{x}$

$473 - 0.14x^{\frac{1}{2}}$

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135. $155.3e^{0.32189t} + 144.7$

5,502

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136. $6t^{5/2} + 4e^{-t} + 2$

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137. $-\frac{1}{(4x-5)^3} + C$

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138. $-\frac{1}{4\left(5x^2+14x\right)^2} + C$

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139. $\frac{1}{9}e^{9x^9} + C$

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140. A. Substitute u for the exponent on e. Let u = **$16t - 8t^2$**, so that du = (**$16 - 16t$**) dt.

$\frac{1}{16}e^{16t - 8t^2} + C$

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141. $\frac{2}{5}e^{5\sqrt{s}} + C$

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142. $\frac{2}{3}(x-1)^{\frac{3}{2}} + 2(x-1)^{\frac{1}{2}} + C$

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143. $\frac{1}{55}(1 + 5\ln x)^{11} + C$

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144. $\ln\left(1 + e^{9y}\right) + C$

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145. $27 \ln|\ln 5x| + C$

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146. $6\left(x^2 + 30{,}000\right)^{\frac{1}{3}} - 150$

66

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147. 34

34

34

35

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148. 40.5

40.5

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149. 10
