Student: ____________________	**Instructor:** Alfredo Alvarez	**Assignment:**
Date: ____________________	**Course:** 2413 Cal I	CAL2413ANSWERSI105FIESTABB

1. For the position function $s(t) = -16t^2 + 107t$, complete the following table with the appropriate average velocities. Then make a conjecture about the value of the instantaneous velocity at t = 1.

Time Interval	[1, 2]	[1, 1.5]	[1, 1.1]	[1, 1.01]	[1, 1.001]
Average Velocity	____	____	____	____	____

Complete the following table.

Time Interval	[1, 2]	[1, 1.5]	[1, 1.1]	[1, 1.01]	[1, 1.001]
Average Velocity					

(Type exact answers. Type integers or decimals.)

The value of the instantaneous velocity at t = 1 is ______.
(Round to the nearest integer as needed.)

Answers 59

67

73.4

74.84

74.984

75

ID: 2.1.17

2. Let $f(x) = \frac{x^2 - 9}{x + 3}$. **(a)** Calculate f(x) for each value of x in the following table. **(b)** Make a conjecture about the value of $\lim_{x \to -3} \frac{x^2 - 9}{x + 3}$.

(a) Calculate f(x) for each value of x in the following table.

x	−2.9	−2.99	−2.999	−2.9999
$f(x) = \frac{x^2 - 9}{x + 3}$				
x	−3.1	−3.01	−3.001	−3.0001
$f(x) = \frac{x^2 - 9}{x + 3}$				

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

(b) Make a conjecture about the value of $\lim_{x \to -3} \frac{x^2 - 9}{x + 3}$.

$\lim_{x \to -3} \frac{x^2 - 9}{x + 3} =$ ____ (Type an integer or a decimal.)

Answers −5.9

−5.99

−5.999

−5.9999

−6.1

−6.01

−6.001

−6.0001

−6

ID: 2.2.7

3. Let $g(t) = \frac{t-4}{\sqrt{t}-2}$.

a. Make two tables, one showing the values of g for t = 3.9, 3.99, and 3.999 and one showing values of g for t = 4.1, 4.01, and 4.001.

b. Make a conjecture about the value of $\lim_{t\to 4} \frac{t-4}{\sqrt{t}-2}$.

a. Make a table showing the values of g for t = 3.9, 3.99, and 3.999.

t	3.9	3.99	3.999
g(t)			

(Round to four decimal places.)

Make a table showing the values of g for t = 4.1, 4.01, and 4.001.

t	4.1	4.01	4.001
g(t)			

(Round to four decimal places.)

b. Make a conjecture about the value of $\lim_{t\to 4} \frac{t-4}{\sqrt{t}-2}$. Select the correct choice below and fill in any answer boxes in your choice.

A. $\lim_{t\to 4} \frac{t-4}{\sqrt{t}-2} =$ ________ (Simplify your answer.)

B. The limit does not exist.

Answers 3.9748

3.9975

3.9997

4.0248

4.0025

4.0003

A. $\lim_{t\to 4} \frac{t-4}{\sqrt{t}-2} =$ **4** (Simplify your answer.)

ID: 2.2.9

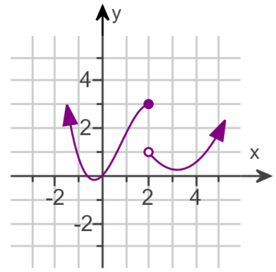
4. Use the graph to find the following limits and function value.

a. $\lim_{x \to 2^-} f(x)$

b. $\lim_{x \to 2^+} f(x)$

c. $\lim_{x \to 2} f(x)$

d. f(2)



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

A. $\lim_{x \to 2^-} f(x) =$ ______ (Type an integer.)

B. The limit does not exist.

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

A. $\lim_{x \to 2^+} f(x) =$ ______ (Type an integer.)

B. The limit does not exist.

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

A. $\lim_{x \to 2} f(x) =$ ______ (Type an integer.)

B. The limit does not exist.

d. Find the function value. Select the correct choice below and fill in any answer boxes in your choice.

A. f(2) = ______ (Type an integer.)

B. The answer is undefined.

Answers A. $\lim_{x \to 2^-} f(x) =$ **3** (Type an integer.)

A. $\lim_{x \to 2^+} f(x) =$ **1** (Type an integer.)

B. The limit does not exist.

A. f(2) = **3** (Type an integer.)

ID: 2.2.15

5. Explain why $\lim_{x \to 6} \frac{x^2 - 9x + 18}{x - 6} = \lim_{x \to 6} (x - 3)$, and then evaluate $\lim_{x \to 6} \frac{x^2 - 9x + 18}{x - 6}$.

Choose the correct answer below.

- **A.** The limits $\lim_{x \to 6} \frac{x^2 - 9x + 18}{x - 6}$ and $\lim_{x \to 6} (x - 3)$ equal the same number when evaluated using direct substitution.
- **B.** Since each limit approaches 6, it follows that the limits are equal.
- **C.** The numerator of the expression $\frac{x^2 - 9x + 18}{x - 6}$ simplifies to $x - 3$ for all x, so the limits are equal.
- **D.** Since $\frac{x^2 - 9x + 18}{x - 6} = x - 3$ whenever $x \neq 6$, it follows that the two expressions evaluate to the same number as x approaches 6.

Now evaluate the limit.

$\lim_{x \to 6} \frac{x^2 - 9x + 18}{x - 6} =$ ______ (Simplify your answer.)

Answers D.

Since $\frac{x^2 - 9x + 18}{x - 6} = x - 3$ whenever $x \neq 6$, it follows that the two expressions evaluate to the same number as x approaches 6.

3

ID: 2.3.5

6. Assume $\lim_{x\to 4} f(x) = 8$ and $\lim_{x\to 4} h(x) = 4$. Compute the following limit and state the limit laws used to justify the computation.

$$\lim_{x\to 4} \frac{f(x)}{h(x)}$$

$\lim_{x\to 4} \frac{f(x)}{h(x)} =$ ____ (Simplify your answer.)

Select each limit law used to justify the computation.

- ☐ **A.** Constant multiple
- ☐ **B.** Difference
- ☐ **C.** Power
- ☐ **D.** Product
- ☐ **E.** Root
- ☐ **F.** Quotient
- ☐ **G.** Sum

Answers 2

F. Quotient

ID: 2.3.8

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7. Find the following limit or state that it does not exist.

$$\lim_{x\to 1} \frac{\sqrt{x} - 1}{x - 1}$$

Simplify the given limit.

$\lim_{x\to 1} \frac{\sqrt{x} - 1}{x - 1} = \lim_{x\to 1} \left(\text{____} \right)$ (Simplify your answer.)

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

- ○ **A.** $\lim_{x\to 1} \frac{\sqrt{x} - 1}{x - 1} =$ ____ (Type an exact answer.)
- ○ **B.** The limit does not exist.

Answers $\frac{1}{\sqrt{x} + 1}$

A. $\lim_{x\to 1} \frac{\sqrt{x} - 1}{x - 1} = \mathbf{\frac{1}{2}}$ (Type an exact answer.)

ID: 2.3.41-Setup & Solve

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8. Determine the following limit.

$$\lim_{w \to \infty} \frac{48w^2 + 3w + 1}{\sqrt{36w^4 + 2w^3}}$$

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

A. $\lim_{w \to \infty} \frac{48w^2 + 3w + 1}{\sqrt{36w^4 + 2w^3}} =$ __________ (Simplify your answer.)

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

Answer: A. $\lim_{w \to \infty} \frac{48w^2 + 3w + 1}{\sqrt{36w^4 + 2w^3}} =$ **8** (Simplify your answer.)

ID: 2.5.29

9. Determine $\lim_{x\to\infty} f(x)$ and $\lim_{x\to -\infty} f(x)$ for the following function. Then give the horizontal asymptotes of f, if any.

$$f(x) = \frac{8x}{16x+4}$$

Evaluate $\lim_{x\to\infty} f(x)$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $\lim_{x\to\infty} \frac{8x}{16x+4} =$ ______ (Simplify your answer.)
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

Evaluate $\lim_{x\to -\infty} f(x)$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $\lim_{x\to -\infty} \frac{8x}{16x+4} =$ ______ (Simplify your answer.)
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

Give the horizontal asymptotes of f, if any. Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- **A.** The function has one horizontal asymptote, ______.
(Type an equation.)
- **B.** The function has two horizontal asymptotes. The top asymptote is ______ and the bottom asymptote is ______.
(Type equations.)
- **C.** The function has no horizontal asymptotes.

Answers A. $\lim_{x\to\infty} \frac{8x}{16x+4} = \frac{1}{2}$ (Simplify your answer.)

A. $\lim_{x\to -\infty} \frac{8x}{16x+4} = \frac{1}{2}$ (Simplify your answer.)

A. The function has one horizontal asymptote, $y = \frac{1}{2}$. (Type an equation.)

ID: 2.5.37

10. Evaluate $\lim_{x \to \infty} f(x)$ and $\lim_{x \to -\infty} f(x)$ for the following rational function. Use ∞ or $-\infty$ where appropriate. Then give the horizontal asymptote of f (if any).

$$f(x) = \frac{12x^2 - 9x + 7}{4x^2 + 2}$$

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

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

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

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

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

- **A.** The horizontal asymptote is y = ______.
- **B.** There are no horizontal asymptotes.

Answers A. $\lim_{x \to \infty} f(x) =$ **3** (Simplify your answer.)

A. $\lim_{x \to -\infty} f(x) =$ **3** (Simplify your answer.)

A. The horizontal asymptote is y = **3**.

ID: 2.5.39

11. Determine $\lim_{x\to\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$ for the following function. Then give the horizontal asymptotes of f, if any.

$$f(x) = \frac{5x^5 - 5}{x^6 + 7x^4}$$

Evaluate $\lim_{x\to\infty} f(x)$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $\lim_{x\to\infty} \frac{5x^5 - 5}{x^6 + 7x^4} =$ _______ (Simplify your answer.)
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

Evaluate $\lim_{x\to-\infty} f(x)$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** $\lim_{x\to-\infty} \frac{5x^5 - 5}{x^6 + 7x^4} =$ _______ (Simplify your answer.)
- **B.** The limit does not exist and is neither ∞ nor $-\infty$.

Identify the horizontal asymptotes. Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- **A.** The function has one horizontal asymptote, _______.
(Type an equation.)
- **B.** The function has two horizontal asymptotes. The top asymptote is _______ and the bottom asymptote is _______.
(Type equations.)
- **C.** The function has no horizontal asymptotes.

Answers A. $\lim_{x\to\infty} \frac{5x^5 - 5}{x^6 + 7x^4} =$ **0** (Simplify your answer.)

A. $\lim_{x\to-\infty} \frac{5x^5 - 5}{x^6 + 7x^4} =$ **0** (Simplify your answer.)

A. The function has one horizontal asymptote, **y = 0**. (Type an equation.)

ID: 2.5.41

12. Find all the asymptotes of the function.

$$f(x) = \frac{4x^2 + 8}{2x^2 + 7x - 9}$$

Find the horizontal asymptotes. Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- **A.** The function has one horizontal asymptote, ________.
(Type an equation using y as the variable.)
- **B.** The function has two horizontal asymptotes. The top asymptote is ________ and the bottom asymptote is ________.
(Type equations using y as the variable.)
- **C.** The function has no horizontal asymptotes.

Find the vertical asymptotes. Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- **A.** The function has one vertical asymptote, ________.
(Type an equation using x as the variable.)
- **B.** The function has two vertical asymptotes. The leftmost asymptote is ________ and the rightmost asymptote is ________.
(Type equations using x as the variable.)
- **C.** The function has no vertical asymptotes.

Find the slant asymptote(s). Select the correct choice below and, if necessary, fill in the answer box(es) to complete your choice.

- **A.** The function has one slant asymptote, ________.
(Type an equation using x and y as the variables.)
- **B.** The function has two slant asymptotes. The asymptote with the larger slope is ________ and the asymptote with the smaller slope is ________.
(Type equations using x and y as the variables.)
- **C.** The function has no slant asymptotes.

Answers A. The function has one horizontal asymptote, **$y = 2$**. (Type an equation using y as the variable.)

B.

The function has two vertical asymptotes. The leftmost asymptote is **$x = -\frac{9}{2}$** and the rightmost asymptote is **$x = 1$**.
(Type equations using x as the variable.)

C. The function has no slant asymptotes.

ID: EXTRA 2.66

13. Determine the intervals on which the following function is continuous.

$$f(x) = \frac{x^2 - 7x + 12}{x^2 - 9}$$

On what interval(s) is f continuous?

(Simplify your answer. Type your answer in interval notation. Use a comma to separate answers as needed.)

Answer: $(-\infty, -3), (-3, 3), (3, \infty)$

ID: 2.6.28

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14. Evaluate the following limit.

$$\lim_{x \to 5} \sqrt{x^2 + 24}$$

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

A. $\lim_{x \to 5} \sqrt{x^2 + 24} =$ _____, because $x^2 + 24$ is continuous for all x and the square root function is continuous for all $x \geq 0$.
(Type an integer or a fraction.)

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

Answer: A.

$\lim_{x \to 5} \sqrt{x^2 + 24} =$ **7**, because $x^2 + 24$ is continuous for all x and the square root function is continuous for all $x \geq 0$.
(Type an integer or a fraction.)

ID: 2.6.53

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15. Suppose x lies in the interval (1,5) with $x \neq 3$. Find the smallest positive value of δ such that the inequality $0 < |x - 3| < \delta$ is true for all possible values of x.

The smallest positive value of δ is _____. (Type an integer or a fraction.)

Answer: 2

ID: 2.7.1

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16. Use the precise definition of a limit to prove the following limit. Specify a relationship between ε and δ that guarantees the limit exists.

$$\lim_{x \to 0} (6x - 9) = -9$$

Let $\varepsilon > 0$ be given. Choose the correct proof below.

- **A.** Choose $\delta = \frac{\varepsilon}{6}$. Then, $|(6x-9) - -9| < \varepsilon$ whenever $0 < |x - 0| < \delta$.
- **B.** Choose $\delta = \varepsilon$. Then, $|(6x-9) - -9| < \varepsilon$ whenever $0 < |x - 0| < \delta$.
- **C.** Choose $\delta = 6\varepsilon$. Then, $|(6x-9) - -9| < \varepsilon$ whenever $0 < |x - 0| < \delta$.
- **D.** Choose $\delta = \frac{\varepsilon}{9}$. Then, $|(6x-9) - -9| < \varepsilon$ whenever $0 < |x - 0| < \delta$.
- **E.** None of the above proofs is correct.

Answer: A. Choose $\delta = \frac{\varepsilon}{6}$. Then, $|(6x-9) - -9| < \varepsilon$ whenever $0 < |x - 0| < \delta$.

ID: 2.7.19

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17. Find the average velocity of the function over the given interval.

$y = \frac{3}{x-2}$, [4,7]

- **A.** 7
- **B.** $-\frac{3}{10}$
- **C.** 2
- **D.** $\frac{1}{3}$

Answer: B. $-\frac{3}{10}$

ID: 2.1-3

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18. Find all vertical asymptotes of the given function.

$$g(x) = \frac{x + 11}{x^2 + 64x}$$

- **A.** $x = 0, x = -64$
- **B.** $x = 0, x = -8, x = 8$
- **C.** $x = -8, x = 8$
- **D.** $x = -64, x = -11$

Answer: A. $x = 0, x = -64$

ID: 2.4-19

19. Divide numerator and denominator by the highest power of x in the denominator to find the limit at infinity.

$$\lim_{x \to \infty} \frac{\sqrt[3]{x} + 6x - 6}{-3x + x^{2/3} - 4}$$

- **A.** -2
- **B.** $-\frac{1}{2}$
- **C.** $-\infty$
- **D.** 0

Answer: A. -2

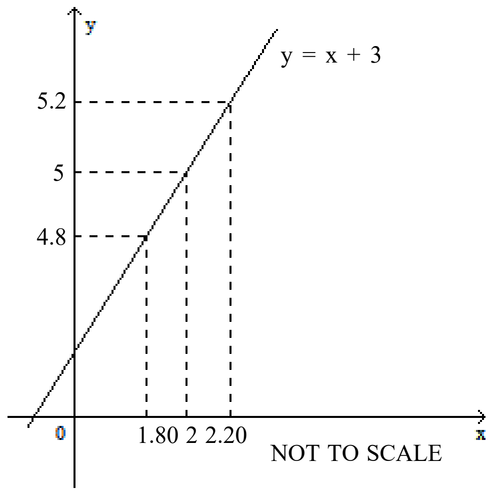
ID: 2.5-12

20. Use the graph to find a $\delta > 0$ such that for all x, $0 < |x - x_0| < \delta$ and $|f(x) - L| < \varepsilon$. Use the following information: $f(x) = x + 3$, $\varepsilon = 0.2$, $x_0 = 2$, $L = 5$.

[1] Click the icon to view the graph.

- **A.** 0.1
- **B.** 0.4
- **C.** 3
- **D.** 0.2

1: Graph



Answer: D. 0.2

ID: 2.7-1

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21. Find the value of the derivative of the function at the given point.

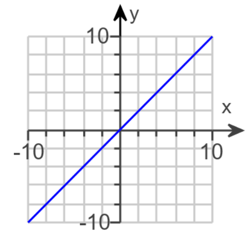
$f(x) = 2x^2 - 4x; (-1,6)$

$f'(-1) =$ ____ (Type an integer or a simplified fraction.)

Answer: -8

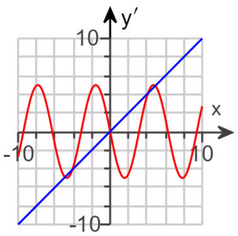
ID: 3.1.1

22. Match the graph of the function on the right with the graph of its derivative.

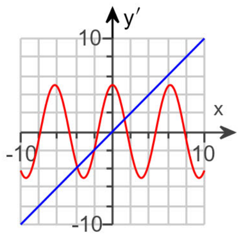


Choose the correct graph of the function (in blue) and its derivative (in red) below.

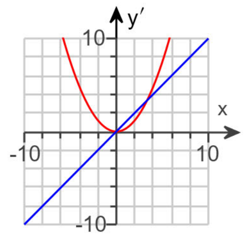
A.



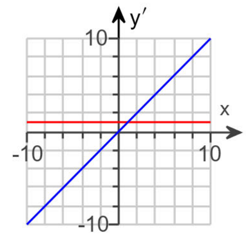
B.



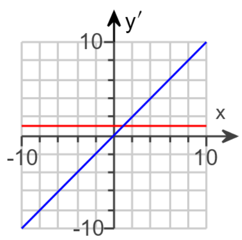
C.



D.



Answer:



D.

ID: 3.2.49

23. Evaluate the derivative of the function given below using a limit definition of the derivative.

$f(x) = x^2 - 3x + 1$

$f'(x) =$ ________

Answer: $2x - 3$

ID: EXTRA 3.2

24. Use the Quotient Rule to evaluate and simplify $\frac{d}{dx}\left(\frac{x-6}{4x-3}\right)$.

$\frac{d}{dx}\left(\frac{x-6}{4x-3}\right) =$ ______

Answer: $\frac{21}{(4x-3)^2}$

ID: 3.4.5

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25. **a.** Use the Product Rule to find the derivative of the given function.
b. Find the derivative by expanding the product first.

$f(x) = (x-6)(2x+3)$

a. Use the product rule to find the derivative of the function. Select the correct answer below and fill in the answer box(es) to complete your choice.

- **A.** The derivative is $(x-6)($ ______ $) + (2x+3)($ ______ $)$.
- **B.** The derivative is $($ ______ $)x(2x+3)$.
- **C.** The derivative is $($ ______ $)(x-6)$.
- **D.** The derivative is $(x-6)(2x+3) + ($ ______ $)$.
- **E.** The derivative is $(x-6)(2x+3)($ ______ $)$.

b. Expand the product.

$(x-6)(2x+3) =$ ______ (Simplify your answer.)

Using either approach, $\frac{d}{dx}(x-6)(2x+3) =$ ______.

Answers A. The derivative is $(x-6)($ **2** $) + (2x+3)($ **1** $)$.

$2x^2 - 9x - 18$

$4x - 9$

ID: 3.4.9

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26. If $f(x) = \sin x$, then what is the value of $f'\left(\frac{3\pi}{2}\right)$?

$f'\left(\frac{3\pi}{2}\right) =$ ______ (Simplify your answer.)

Answer: 0

ID: 3.5.5

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27. Evaluate the limit.

$$\lim_{x \to 0} \frac{\sin 5x}{\sin 7x}$$

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

- **A.** $\lim_{x \to 0} \frac{\sin 5x}{\sin 7x} =$ ______
- **B.** The limit is undefined.

Answer: A. $\lim_{x \to 0} \frac{\sin 5x}{\sin 7x} = \frac{5}{7}$

ID: 3.5.13

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28. Find $\frac{dy}{dx}$ for the following function.

$$y = 7 \sin x + 6 \cos x$$

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

Answer: $7 \cos x - 6 \sin x$

ID: 3.5.23

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29. Find the derivative of the following function.

$$y = e^{-x} \sin x$$

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

Answer: $e^{-x}(\cos x - \sin x)$

ID: 3.5.25

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30. Find an equation of the line tangent to the following curve at the given point.

$$y = -6x^2 + 5 \sin x;\ P(0,0)$$

The equation for the tangent line is ______.

Answer: $y = 5x$

ID: EXTRA 3.73

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31. Let $h(x) = f(g(x))$ and $p(x) = g(f(x))$. Use the table below to compute the following derivatives.

a. $h'(2)$
b. $p'(1)$

x	**1**	**2**	**3**	**4**
$f(x)$	1	3	2	4
$f'(x)$	−6	−9	−3	−1
$g(x)$	4	1	3	2
$g'(x)$	$\frac{7}{8}$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{5}{8}$

$h'(2) =$ ☐ (Simplify your answer.)

$p'(1) =$ ☐ (Simplify your answer.)

Answers $-\frac{3}{4}$

$-\frac{21}{4}$

ID: 3.7.25

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32. Calculate the derivative of the following function.

$$y = (4x - 7)^8$$

$\frac{dy}{dx} =$ ☐

Answer: $32(4x - 7)^7$

ID: 3.7.27

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33. Calculate the derivative of the following function.

$$y = 3\left(6x^5 + 1\right)^{-4}$$

$\frac{dy}{dx} =$ ☐

Answer: $\frac{-360x^4}{\left(6x^5 + 1\right)^5}$

ID: 3.7.31

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34. Calculate the derivative of the following function.

$y = \cos(7t + 4)$

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

Answer: $-7 \sin(7t + 4)$

ID: 3.7.32

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35. Calculate $\frac{dy}{dx}$ using implicit differentiation.

$x = y^4$

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

Answer: $\frac{1}{4y^3}$

ID: 3.8.5

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36. Carry out the following steps for the given curve.

a. Use implicit differentiation to find $\frac{dy}{dx}$.

b. Find the slope of the curve at the given point.

$x^3 + y^3 = 0; (-4, 4)$

a. Use implicit differentiation to find $\frac{dy}{dx}$.

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

b. Find the slope of the curve at the given point.

The slope of $x^3 + y^3 = 0$ at $(-4, 4)$ is ______.
(Simplify your answer.)

Answers $\frac{-x^2}{y^2}$

-1

ID: 3.8.13

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37. Find $\frac{d}{dx}\left(\ln\sqrt{x^2+10}\right)$.

$\frac{d}{dx}\left(\ln\sqrt{x^2+10}\right) =$ ☐

Answer: $\frac{x}{x^2+10}$

ID: 3.9.9

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38. Evaluate the derivative of the function.

$f(x) = \sin^{-1}\left(7x^5\right)$

$f'(x) =$ ☐

Answer: $\frac{35x^4}{\sqrt{1-49x^{10}}}$

ID: 3.10.13

---

39. Find the derivative of the function $y = 3\tan^{-1}(3x)$.

$\frac{dy}{dx} =$ ☐

Answer: $\frac{9}{1+(3x)^2}$

ID: 3.10.19

---

40. Evaluate the derivative of the following function.

$f(s) = \cot^{-1}\left(e^s\right)$

$\frac{d}{ds}\cot^{-1}\left(e^s\right) =$ ☐

Answer: $-\frac{e^s}{1+e^{2s}}$

ID: 3.10.39

---

41. The sides of a square increase in length at a rate of 6 m/sec.

a. At what rate is the area of the square changing when the sides are 15 m long?
b. At what rate is the area of the square changing when the sides are 23 m long?

a. Write an equation relating the area of a square, A, and the side length of the square, s.

[ ]

Differentiate both sides of the equation with respect to t.

$$\frac{dA}{dt} = \left(\boxed{} \right) \frac{ds}{dt}$$

The area of the square is changing at a rate of [ ] (1) [ ] when the sides are 15 m long.

b. The area of the square is changing at a rate of [ ] (2) [ ] when the sides are 23 m long.

(1) ○ m / s
○ m^3 / s
○ m^2 / s
○ m

(2) ○ m^3 / s
○ m
○ m^2 / s
○ m / s

Answers $A = s^2$

2s

180

(1) m^2 / s

276

(2) m^2 / s

ID: 3.11.11-Setup & Solve

42. Find an equation for the tangent to the curve at the given point.

$y = x^2 - 4$, (4,12)

○ **A.** $y = 8x - 40$
○ **B.** $y = 8x - 36$
○ **C.** $y = 4x - 20$
○ **D.** $y = 8x - 20$

Answer: D. $y = 8x - 20$

ID: 3.1-2

43. At time t, the position of a body moving along the s-axis is $s = t^3 - 9t^2 + 24t$ m. Find the displacement of the body from t = 0 to t = 3.

- **A.** 22 m
- **B.** 18 m
- **C.** 20 m
- **D.** 42 m

Answer: B. 18 m

ID: 3.6-3

---

44. Use implicit differentiation to find dy/dx.

$xy + x = 2$

- **A.** $-\frac{1+x}{y}$
- **B.** $-\frac{1+y}{x}$
- **C.** $\frac{1+x}{y}$
- **D.** $\frac{1+y}{x}$

Answer: B. $-\frac{1+y}{x}$

ID: 3.8-4

---

45. Find the derivative of the function.

$y = \log_4 \sqrt{9x+3}$

- A. $\dfrac{9}{\ln 4\,(9x+3)}$
- B. $\dfrac{9}{2(\ln 4)(9x+3)}$
- C. $\dfrac{9\ln 4}{9x+3}$
- D. $\dfrac{9}{\ln 4}$

Answer: B. $\dfrac{9}{2(\ln 4)(9x+3)}$

ID: 3.9-11

---

46. Boyle's law states that if the temperature of a gas remains constant, then PV = c, where P = pressure, V = volume, and c is a constant. Given a quantity of gas at constant temperature, if V is decreasing at a rate of 9 in^3/sec, at what rate is P increasing when P = 80 lb/in^2 and V = 50 in^3? (Do not round your answer.)

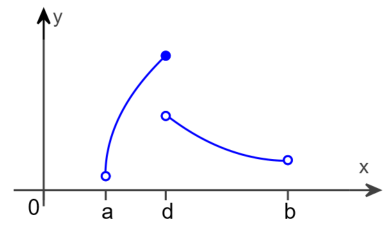
- A. $\dfrac{64}{25}$ lb / in^2 per sec
- B. $\dfrac{4000}{9}$ lb / in^2 per sec
- C. $\dfrac{45}{8}$ lb / in^2 per sec
- D. $\dfrac{72}{5}$ lb / in^2 per sec

Answer: D. $\dfrac{72}{5}$ lb / in^2 per sec

ID: 3.11-7

---

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



Where do the absolute extreme values of the function occur on [a, b]?

- **A.** The absolute maximum occurs at $x = d$ and there is no absolute minimum on [a, b].
- **B.** There is no absolute maximum and the absolute minimum occurs at $x = a$ on [a, b].
- **C.** There is no absolute maximum and there is no absolute minimum on [a, b].
- **D.** The absolute maximum occurs at $x = d$ and the absolute minimum occurs at $x = a$ on [a, b].

Answer: A. The absolute maximum occurs at $x = d$ and there is no absolute minimum on [a, b].

ID: 4.1.13

---

48. Find the critical points of the following function.

$$f(x) = 5x^2 + 3x - 2$$

What is the derivative of $f(x) = 5x^2 + 3x - 2$?

$f'(x) =$ ______

Find the critical points, if any, of f on the domain. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The critical point(s) occur(s) at $x =$ ______.
  (Use a comma to separate answers as needed.)
- **B.** There are no critical points for $f(x) = 5x^2 + 3x - 2$ on the domain.

Answers $10x + 3$

A. The critical point(s) occur(s) at $x = -\frac{3}{10}$.(Use a comma to separate answers as needed.)

ID: 4.1.23-Setup & Solve

49. Find the critical points of the following function.

$$f(x) = -\frac{x^3}{3} + 9x$$

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

- **A.** The critical point(s) occur(s) at x = ______.
  (Use a comma to separate answers as needed.)
- **B.** There are no critical points.

Answer: A. The critical point(s) occur(s) at x = **3, − 3**.(Use a comma to separate answers as needed.)

ID: 4.1.25

---

50. Determine the location and value of the absolute extreme values of f on the given interval, if they exist.

$$f(x) = -x^2 + 12 \text{ on } [-3,4]$$

What is/are the absolute maximum/maxima of f on the given interval? Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- **A.** The absolute maximum/maxima is/are ______ at x = ______.
  (Use a comma to separate answers as needed.)
- **B.** There is no absolute maximum of f on the given interval.

What is/are the absolute minimum/minima of f on the given interval? Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- **A.** The absolute minimum/minima is/are ______ at x = ______.
  (Use a comma to separate answers as needed.)
- **B.** There is no absolute minimum of f on the given interval.

Answers A. The absolute maximum/maxima is/are **12** at x = **0**.
(Use a comma to separate answers as needed.)

A. The absolute minimum/minima is/are **− 4** at x = **4**.
(Use a comma to separate answers as needed.)

ID: 4.1.43

51. A stone is launched vertically upward from a cliff 384 ft above the ground at a speed of 32 ft / s. Its height above the ground t seconds after the launch is given by $s = -16t^2 + 32t + 384$ for $0 \le t \le 6$. When does the stone reach its maximum height?

Find the derivative of s.

$s' =$ [ ]

The stone reaches its maximum height at [ ] s.
(Simplify your answer.)

Answers $-32t + 32$

1

ID: 4.1.73

52. At what points c does the conclusion of the Mean Value Theorem hold for $f(x) = x^3$ on the interval $[-14,14]$?

The conclusion of the Mean Value Theorem holds for c = [ ].
(Use a comma to separate answers as needed. Type an exact answer, using radicals as needed.)

Answer: $\frac{14\sqrt{3}}{3}, -\frac{14\sqrt{3}}{3}$

ID: 4.2.8

53. **a.** Determine whether the Mean Value Theorem applies to the function $f(x) = 6 - x^2$ on the interval $[-1,2]$.
b. If so, find the point(s) that are guaranteed to exist by the Mean Value Theorem.

a. Choose the correct answer below.

- **A.** Yes, because the function is continuous on the interval $[-1,2]$ and differentiable on the interval $(-1,2)$.
- **B.** No, because the function is differentiable on the interval $(-1,2)$, but is not continuous on the interval $[-1,2]$.
- **C.** No, because the function is continuous on the interval $[-1,2]$, but is not differentiable on the interval $(-1,2)$.
- **D.** No, because the function is not continuous on the interval $[-1,2]$, and is not differentiable on the interval $(-1,2)$.

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

- **A.** The point(s) is/are x = ______.
(Simplify your answer. Use a comma to separate answers as needed.)
- **B.** The Mean Value Theorem does not apply in this case.

Answers A. Yes, because the function is continuous on the interval $[-1,2]$ and differentiable on the interval $(-1,2)$.

A. The point(s) is/are $x = \frac{1}{2}$.
(Simplify your answer. Use a comma to separate answers as needed.)

ID: 4.2.21

---

54. Find the intervals on which f is increasing and the intervals on which it is decreasing.

$f(x) = 10 - x^2$

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

- **A.** The function is increasing on ______ and decreasing on ______.
(Simplify your answers. Type your answers in interval notation. Use a comma to separate answers as needed.)
- **B.** The function is decreasing on ______. The function is never increasing.
(Simplify your answer. Type your answer in interval notation. Use a comma to separate answers as needed.)
- **C.** The function is increasing on ______. The function is never decreasing.
(Simplify your answer. Type your answer in interval notation. Use a comma to separate answers as needed.)
- **D.** The function is never increasing nor decreasing.

Answer: A. The function is increasing on $(-\infty,0)$ and decreasing on $(0,\infty)$.
(Simplify your answers. Type your answers in interval notation. Use a comma to separate answers as needed.)

ID: 4.3.19

---

55. Find the intervals on which f is increasing and the intervals on which it is decreasing.

$f(x) = -9 - x + 3x^2$

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

- **A.** The function is increasing on ________ and decreasing on ________.
(Simplify your answers. Type your answers in interval notation. Use a comma to separate answers as needed.)
- **B.** The function is increasing on ________. The function is never decreasing.
(Simplify your answer. Type your answer in interval notation. Use a comma to separate answers as needed.)
- **C.** The function is decreasing on ________. The function is never increasing.
(Simplify your answer. Type your answer in interval notation. Use a comma to separate answers as needed.)
- **D.** The function is never increasing nor decreasing.

Answer: A. The function is increasing on $\left(\frac{1}{6},\infty\right)$ and decreasing on $\left(-\infty,\frac{1}{6}\right)$.
(Simplify your answers. Type your answers in interval notation. Use a comma to separate answers as needed.)

ID: 4.3.25

56. Locate the critical points of the following function. Then use the Second Derivative Test to determine whether they correspond to local maxima, local minima, or neither.

$f(x) = -x^3 + 15x^2$

What is(are) the critical point(s) of f? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The critical point(s) is(are) x = ______.
  (Use a comma to separate answers as needed. Type an integer or a simplified fraction.)
- **B.** There are no critical points for f.

Find $f''(x)$.

$f''(x) =$ ______

What is/are the local minimum/minima of f? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The local minimum/minima of f is/are at x = ______.
  (Use a comma to separate answers as needed. Type an integer or a simplified fraction.)
- **B.** There is no local minimum of f.

What is/are the local maximum/maxima of f? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The local maximum/maxima of f is/are at x = ______.
  (Use a comma to separate answers as needed. Type an integer or a simplified fraction.)
- **B.** There is no local maximum of f.

Answers A. The critical point(s) is(are) x = **0,10**.
(Use a comma to separate answers as needed. Type an integer or a simplified fraction.)

$-6x + 30$

A. The local minimum/minima of f is/are at x = **0**.
(Use a comma to separate answers as needed. Type an integer or a simplified fraction.)

A. The local maximum/maxima of f is/are at x = **10**.
(Use a comma to separate answers as needed. Type an integer or a simplified fraction.)

ID: 4.3.77-Setup & Solve

57. Locate the critical points of the following function. Then use the Second Derivative Test to determine whether they correspond to local maxima, local minima, or neither.

$$f(x) = -2x^3 - 12x^2 + 8$$

What is(are) the critical point(s) of f? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The critical point(s) is(are) x = __________.
  (Use a comma to separate answers as needed. Type an integer or a simplified fraction.)
- **B.** There are no critical points for f.

What is/are the local maximum/maxima of f? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The local maximum/maxima of f is/are at x = __________.
  (Use a comma to separate answers as needed. Type an integer or a simplified fraction.)
- **B.** There is no local maximum of f.

What is/are the local minimum/minima of f? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- **A.** The local minimum/minima of f is/are at x = __________.
  (Use a comma to separate answers as needed. Type an integer or a simplified fraction.)
- **B.** There is no local minimum of f.

Answers A. The critical point(s) is(are) x = **0, −4**.
(Use a comma to separate answers as needed. Type an integer or a simplified fraction.)

A. The local maximum/maxima of f is/are at x = **0**.
(Use a comma to separate answers as needed. Type an integer or a simplified fraction.)

A. The local minimum/minima of f is/are at x = **−4**.
(Use a comma to separate answers as needed. Type an integer or a simplified fraction.)

ID: 4.3.83

---

58. Use a linear approximation to estimate the following quantity. Choose a value of a to produce a small error.

ln (1.09)

What is the value found using the linear approximation?

ln (1.09) ≈ __________ (Round to two decimal places as needed.)

Answer: 0.09

ID: 4.6.41

---

59. Consider the following function and express the relationship between a small change in x and the corresponding change in y in the form $dy = f'(x)dx$.

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

$dy = (\square)\,dx$

Answer: $6x^2 - 4$

ID: 4.6.67

---

60. Evaluate the following limit. Use l'Hôpital's Rule when it is convenient and applicable.

$$\lim_{x \to 0} \frac{6 \sin 7x}{5x}$$

Use l'Hôpital's Rule to rewrite the given limit so that it is not an indeterminate form.

$$\lim_{x \to 0} \frac{6 \sin 7x}{5x} = \lim_{x \to 0} (\square)$$

Evaluate the limit.

$$\lim_{x \to 0} \frac{6 \sin 7x}{5x} = \square$$ (Type an exact answer.)

Answers $\dfrac{42 \cos (7x)}{5}$

$\dfrac{42}{5}$

ID: 4.7.29-Setup & Solve

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61. Use a calculator or program to compute the first 10 iterations of Newton's method when they are applied to the following function with the given initial approximation.

$f(x) = x^2 - 23; x_0 = 5$

k	x_k	k	x_k
0		6	
1		7	
2		8	
3		9	
4		10	
5			

(Round to six decimal places as needed.)

Answers 5.000000

4.795832

4.800000

4.795832

4.795833

4.795832

4.795832

4.795832

4.795832

4.795832

4.795832

ID: 4.8.13-T

62. Determine the following indefinite integral. Check your work by differentiation.

$$\int \left(9x^{17} - 11x^{21}\right) dx$$

$\int \left(9x^{17} - 11x^{21}\right) dx =$ ______ (Use C as the arbitrary constant.)

Answer: $\frac{x^{18}}{2} - \frac{x^{22}}{2} + C$

ID: 4.9.23

63. Evaluate the following indefinite integral.

$$\int \left(\frac{10}{\sqrt{x}} + 10\sqrt{x} \right) dx$$

$\int \left(\frac{10}{\sqrt{x}} + 10\sqrt{x} \right) dx =$ ☐
(Use C as the arbitrary constant.)

Answer: $20\sqrt{x} + \frac{20}{3}x^{\frac{3}{2}} + C$

ID: 4.9.25

---

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

$\int (6x+5)^2 dx =$ ☐
(Use C as the arbitrary constant.)

Answer: $12x^3 + 30x^2 + 25x + C$

ID: 4.9.27

---

65. Determine the following indefinite integral. Check your work by differentiation.

$$\int 4m\left(11m^2 - 10m\right) dm$$

$\int 4m\left(11m^2 - 10m\right) dm =$ ☐ (Use C as the arbitrary constant.)

Answer: $11m^4 - \frac{40m^3}{3} + C$

ID: 4.9.28

---

66. Determine the following indefinite integral. Check your work by differentiation.

$$\int \left(2x^{\frac{1}{3}} + 3x^{-\frac{1}{3}} + 11\right) dx$$

$\int \left(2x^{\frac{1}{3}} + 3x^{-\frac{1}{3}} + 11\right) dx =$ ☐ (Use C as the arbitrary constant.)

Answer: $\frac{3}{2}x^{\frac{4}{3}} + \frac{9}{2}x^{\frac{2}{3}} + 11x + C$

ID: 4.9.29

---

67. Determine the following indefinite integral. Check your work by differentiation.

$$\int 4\sqrt[6]{x}\, dx$$

$\int 4\sqrt[6]{x}\, dx =$ ☐ (Use C as the arbitrary constant.)

Answer: $\frac{24}{7}x^{\frac{7}{6}} + C$

ID: 4.9.30

---

68. Determine the following indefinite integral. Check your work by differentiation.

$$\int (7x + 1)(4 - x)\, dx$$

$\int (7x + 1)(4 - x)\, dx =$ ☐
(Use C as the arbitrary constant.)

Answer: $-\frac{7}{3}x^{3} + \frac{27}{2}x^{2} + 4x + C$

ID: 4.9.31

---

69. Determine the following indefinite integral.

$$\int \frac{4x^5 - 9x^4}{x^2}\,dx$$

$\int \frac{4x^5 - 9x^4}{x^2}\,dx =$ [ ]

(Use C as the arbitrary constant.)

Answer: $x^4 - 3x^3 + C$

ID: 4.9.35

---

70. For the following function f, find the antiderivative F that satisfies the given condition.

$f(x) = 4x^3 + 5\,\mathbf{sin}\,x,\ F(0) = 2$

The antiderivative that satisfies the given condition is F(x) = [ ].

Answer: $x^4 - 5\,\mathbf{cos}\ x + 7$

ID: 4.9.71

---

71. Given the following velocity function of an object moving along a line, find the position function with the given initial position.

$v(t) = 3t^2 + 6t - 5;\ s(0) = 0$

The position function is s(t) = [ ].

Answer: $t^3 + 3t^2 - 5t$

ID: 4.9.95

---

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

$F(x) = \sqrt[3]{x},\ -8 \le x \le 64$

- **A.** absolute maximum is 0 at $x = 0$; absolute minimum is -2 at $x = -8$
- **B.** absolute maximum is 4 at $x = 64$; absolute minimum is -2 at $x = -8$
- **C.** absolute maximum is 4 at $x = -64$; absolute minimum is -2 at $x = 64$
- **D.** absolute maximum is 4 at $x = 64$; absolute minimum is 0 at $x = 0$

Answer: B. absolute maximum is 4 at $x = 64$; absolute minimum is -2 at $x = -8$

ID: 4.1-13

73.

Find the value or values of c that satisfy the equation $\frac{f(b) - f(a)}{b - a} = f'(c)$ in the conclusion of the Mean Value Theorem for the function and interval.

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

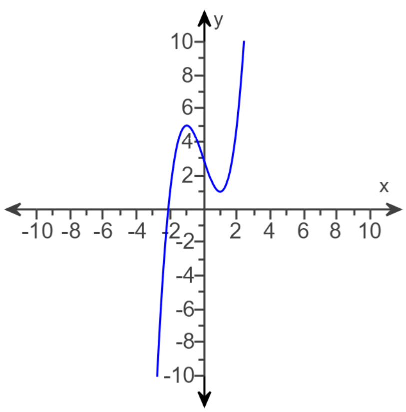
- **A.** $-2, 3$
- **B.** $-\frac{1}{2}, \frac{1}{2}$
- **C.** $\frac{1}{2}$
- **D.** $0, \frac{1}{2}$

Answer: C. $\frac{1}{2}$

ID: 4.2-1

74.

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



- **A.** Local minimum at $x = 1$; local maximum at $x = -1$; concave down on $(-\infty,\infty)$
- **B.** Local minimum at $x = 1$; local maximum at $x = -1$; concave up on $(-\infty,\infty)$
- **C.** Local minimum at $x = 1$; local maximum at $x = -1$; concave down on $(0,\infty)$; concave up on $(-\infty,0)$
- **D.** Local minimum at $x = 1$; local maximum at $x = -1$; concave up on $(0,\infty)$; concave down on $(-\infty,0)$

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

ID: 4.3-9

75. From a thin piece of cardboard 30 in by 30 in, square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? What is the maximum volume? Round to the nearest tenth, if necessary.

- **A.** $20.0 \text{ in} \times 20.0 \text{ in} \times 5.0 \text{ in}$; $2{,}000.0 \text{ in}^3$
- **B.** $20.0 \text{ in} \times 20.0 \text{ in} \times 10.0 \text{ in}$; $4{,}000.0 \text{ in}^3$
- **C.** $15.0 \text{ in} \times 15.0 \text{ in} \times 7.5 \text{ in}$; $1{,}687.5 \text{ in}^3$
- **D.** $10.0 \text{ in} \times 10.0 \text{ in} \times 10.0 \text{ in}$; $1{,}000.0 \text{ in}^3$

Answer: A. $20.0 \text{ in} \times 20.0 \text{ in} \times 5.0 \text{ in}$; $2{,}000.0 \text{ in}^3$

ID: 4.5-1

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76. Solve the initial value problem.

$$\frac{ds}{dt} = \cos t - \sin t, \quad s\left(\frac{\pi}{2}\right) = 10$$

- **A.** $s = \sin t - \cos t + 9$
- **B.** $s = \sin t + \cos t + 9$
- **C.** $s = 2 \sin t + 8$
- **D.** $s = \sin t + \cos t + 11$

Answer: B. $s = \sin t + \cos t + 9$

ID: 4.9-16

---

77. Evaluate the following expressions.

a. $\sum_{k=1}^{18} k$ **b.** $\sum_{k=1}^{9} (2k+2)$ **c.** $\sum_{k=1}^{4} k^2$ **d.** $\sum_{n=1}^{7} \left(2+n^2\right)$

e. $\sum_{m=1}^{5} \frac{2m+2}{9}$ **f.** $\sum_{j=1}^{5} (4j-7)$ **g.** $\sum_{k=1}^{6} k(4k+9)$ **h.** $\sum_{n=0}^{6} \sin\frac{n\pi}{2}$

---

a. $\sum_{k=1}^{18} k =$ ☐ (Type an integer or a simplified fraction.)

b. $\sum_{k=1}^{9} (2k+2) =$ ☐ (Type an integer or a simplified fraction.)

c. $\sum_{k=1}^{4} k^2 =$ ☐ (Type an integer or a simplified fraction.)

d. $\sum_{n=1}^{7} \left(2+n^2\right) =$ ☐ (Type an integer or a simplified fraction.)

e. $\sum_{m=1}^{5} \frac{2m+2}{9} =$ ☐ (Type an integer or a simplified fraction.)

f. $\sum_{j=1}^{5} (4j-7) =$ ☐ (Type an integer or a simplified fraction.)

g. $\sum_{k=1}^{6} k(4k+9) =$ ☐ (Type an integer or a simplified fraction.)

h. $\sum_{n=0}^{6} \sin\frac{n\pi}{2} =$ ☐ (Type an integer or a simplified fraction.)

Answers 171

108

30

154

$\frac{40}{9}$

25

553

1

ID: 5.1.49

78.

The functions f and g are integrable and $\int_3^7 f(x)dx = 9$, $\int_3^7 g(x)dx = 5$, and $\int_6^7 f(x)dx = 2$. Evaluate the integral below or state that there is not enough information.

$$-\int_7^3 3f(x)dx$$

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

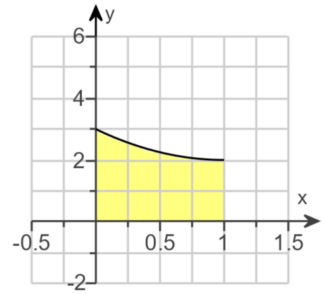
- **A.** $-\int_7^3 3f(x)dx =$ ____________ (Simplify your answer.)
- **B.** There is not enough information to evaluate $-\int_7^3 3f(x)dx$.

Answer: A. $-\int_7^3 3f(x)dx =$ **27** (Simplify your answer.)

ID: EXTRA 5.18

79. Evaluate the following integral using the Fundamental Theorem of Calculus. Discuss whether your result is consistent with the figure.

$$\int_0^1 \left(x^2 - 2x + 3\right) dx$$



$$\int_0^1 \left(x^2 - 2x + 3\right) dx = \square$$

Is your result consistent with the figure?

- **A.** No, because the definite integral is negative and the graph of f lies above the x-axis.
- **B.** No, because the definite integral is positive and the graph of f lies below the x-axis.
- **C.** Yes, because the definite integral is positive and the graph of f lies above the x-axis.
- **D.** Yes, because the definite integral is negative and the graph of f lies below the x-axis.

Answers $\frac{7}{3}$

C. Yes, because the definite integral is positive and the graph of f lies above the x-axis.

ID: 5.3.23

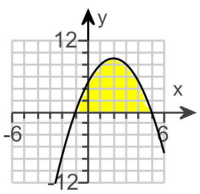
80. Evaluate the following integral using the fundamental theorem of calculus. Sketch the graph of the integrand and shade the region whose net area you have found.

$$\int_{-1}^{5} \left(x^2 - 4x - 5\right)\, dx$$

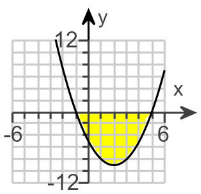
$$\int_{-1}^{5} \left(x^2 - 4x - 5\right)\, dx = \square$$

Choose the correct sketch below.

A.



B.



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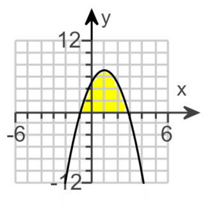

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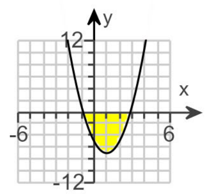
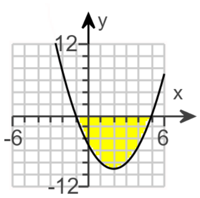


Answers -36



B.

ID: 5.3.25

81. Use the fundamental theorem of calculus to evaluate the following definite integral.

$$\int_{1}^{4} \left(4x^2 + 6\right)\, dx$$

$$\int_{1}^{4} \left(4x^2 + 6\right)\, dx = \square$$

(Type an exact answer.)

Answer: 102

ID: 5.3.29

82. Evaluate the following integral using the Fundamental Theorem of Calculus.

$$\int_3^7 (3-x)(x-7)\,dx$$

$\int_3^7 (3-x)(x-7)\,dx =$ [ ]

(Type an exact answer.)

Answer: $\frac{32}{3}$

ID: 5.3.41

---

83. Find the area of the region bounded by the graph of f and the x-axis on the given interval.

$f(x) = x^2 - 40$; [2,4]

The area is [ ]. (Type an integer or a simplified fraction.)

Answer: $\frac{184}{3}$

ID: 5.3.67

---

84. Simplify the following expression.

$$\frac{d}{dx}\int_x^5 \sqrt{t^4+1}\,dt$$

$\frac{d}{dx}\int_x^5 \sqrt{t^4+1}\,dt =$ [ ]

Answer: $-\sqrt{x^4+1}$

ID: 5.3.75

---

85. Simplify the following expression.

$$\frac{d}{dx}\int_{3}^{x^3} \frac{dp}{p^2}$$

$$\frac{d}{dx}\int_{3}^{x^3} \frac{dp}{p^2} = \square$$

Answer: $\frac{3}{x^4}$

ID: 5.3.77

86. Evaluate the following integral.

$$\int_{0}^{3} (x-3)^3 \, dx$$

$$\int_{0}^{3} (x-3)^3 \, dx = \square$$

(Type an exact answer. Use C as the arbitrary constant as needed.)

Answer: $-\frac{81}{4}$

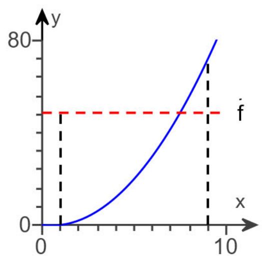
ID: EXTRA 5.57

87. Find the average value of the following function over the given interval. Draw a graph of the function and indicate the average value.

$f(x) = x(x - 1)$; [1,9]

The average value of the function is $\bar{f}$ = ______.

Choose the correct graph of f(x) and $\bar{f}$ below.

A.


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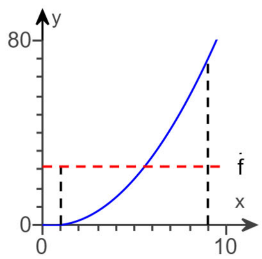

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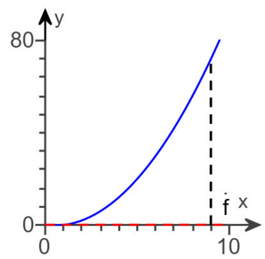
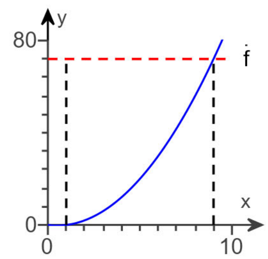
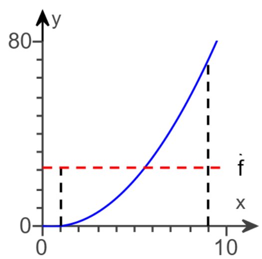


D.


Answers $\frac{76}{3}$

B.


ID: 5.4.30

88. Find the point(s) at which the function $f(x) = 5 - 4x$ equals its average value on the interval [0,2].

The function equals its average value at x = ______.
(Use a comma to separate answers as needed.)

Answer: 1

ID: 5.4.39

89. Use the substitution $u = x^2 + 6$ to find the following indefinite integral. Check your answer by differentiation.

$$\int 2x\left(x^2+6\right)^5 dx$$

$\int 2x\left(x^2+6\right)^5 dx =$ [ ]

(Use C as the arbitrary constant.)

Answer: $\frac{1}{6}\left(x^2+6\right)^6 + C$

ID: 5.5.7

---

90. Use the substitution $u = 6x^2 - 5$ to find the following indefinite integral. Check your answer by differentiation.

$$\int -12x\,\mathbf{sin}\left(6x^2-5\right)\,dx$$

$\int -12x\,\mathbf{sin}\left(6x^2-5\right)\,dx =$ [ ]

(Use C as the arbitrary constant.)

Answer: $\mathbf{cos}\left(6x^2-5\right) + C$

ID: 5.5.8

---

91. Use the substitution $u = 5x^2 + 2x$ to evaluate the indefinite integral below.

$$\int (10x+2)\sqrt{5x^2+2x}\,dx$$

Write the integrand in terms of u.

$\int (10x+2)\sqrt{5x^2+2x}\,dx = \int ($ [ ] $)\,du$

Evaluate the integral.

$\int (10x+2)\sqrt{5x^2+2x}\,dx =$ [ ]

(Use C as the arbitrary constant.)

Answers $\sqrt{u}$

$\frac{2}{3}\left(5x^2+2x\right)^{\frac{3}{2}} + C$

ID: 5.5.10-Setup & Solve

---

92. Use a change of variables or the accompanying table to evaluate the following indefinite integral.

$$\int \frac{e^{2x}}{e^{2x}+7}\,dx$$

[2] Click the icon to view the table of general integration formulas.

Determine a change of variables from x to u. Choose the correct answer below.

- **A.** $u = e^{2x}$
- **B.** $u = \frac{1}{e^{2x}+7}$
- **C.** $u = e^{2x} + 7$
- **D.** $u = 2x$

Write the integral in terms of u.

$$\int \frac{e^{2x}}{e^{2x}+7}\,dx = \int (\square)\,du$$

Evaluate the integral.

$$\int \frac{e^{2x}}{e^{2x}+7}\,dx = \square$$

(Use C as the arbitrary constant.)

2: General Integration Formulas

$$\int \cos ax\,dx = \frac{1}{a}\sin ax + C \qquad \int \sin ax\,dx = -\frac{1}{a}\cos ax + C$$

$$\int \sec^2 ax\,dx = \frac{1}{a}\tan ax + C \qquad \int \csc^2 ax\,dx = -\frac{1}{a}\cot ax + C$$

$$\int \sec ax \tan ax\,dx = \frac{1}{a}\sec ax + C \qquad \int \csc ax \cot ax\,dx = -\frac{1}{a}\csc ax + C$$

$$\int e^{ax}\,dx = \frac{1}{a}e^{ax} + C \qquad \int b^x\,dx = \frac{1}{\ln b}b^x + C,\ b > 0,\ b \neq 1$$

$$\int \frac{dx}{a^2+x^2} = \frac{1}{a}\tan^{-1}\frac{x}{a} + C \qquad \int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1}\frac{x}{a} + C,\ a > 0$$

$$\int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a}\sec^{-1}\left|\frac{x}{a}\right| + C,\ a > 0$$

Answers C. $u = e^{2x} + 7$

$\frac{1}{2u}$

$\frac{1}{2}\ln\left|e^{2x}+7\right| + C$

ID: 5.5.44-Setup & Solve

93. Use a change of variables or the table to evaluate the following definite integral.

$$\int_0^{\pi/42} \mathbf{cos}\, 7x\, dx$$

[3] Click to view the table of general integration formulas.

$$\int_0^{\pi/42} \mathbf{cos}\, 7x\, dx = \square$$ (Type an exact answer.)

3: General Integration Formulas

$$\int \mathbf{cos}\, ax\, dx = \frac{1}{a}\mathbf{sin}\, ax + C$$

$$\int \mathbf{sin}\, ax\, dx = -\frac{1}{a}\mathbf{cos}\, ax + C$$

$$\int \mathbf{sec}^2 ax\, dx = \frac{1}{a}\mathbf{tan}\, ax + C$$

$$\int \mathbf{csc}^2 ax\, dx = -\frac{1}{a}\mathbf{cot}\, ax + C$$

$$\int \mathbf{sec}\, ax\, \mathbf{tan}\, ax\, dx = \frac{1}{a}\mathbf{sec}\, ax + C$$

$$\int \mathbf{csc}\, ax\, \mathbf{cot}\, ax\, dx = -\frac{1}{a}\mathbf{csc}\, ax + C$$

$$\int e^{ax} dx = \frac{1}{a} e^{ax} + C$$

$$\int b^x dx = \frac{1}{\mathbf{ln}\, b} b^x + C,\ b > 0,\ b \neq 1$$

$$\int \frac{dx}{a^2 + x^2} = \frac{1}{a}\mathbf{tan}^{-1}\frac{x}{a} + C$$

$$\int \frac{dx}{\sqrt{a^2 - x^2}} = \mathbf{sin}^{-1}\frac{x}{a} + C,\ a > 0$$

$$\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a}\mathbf{sec}^{-1}\left|\frac{x}{a}\right| + C,\ a > 0$$

Answer: $\frac{1}{14}$

ID: 5.5.45

94. Use a change of variables or the table to evaluate the following definite integral.

$$\int_0^1 15e^{3x}\,dx$$

[4] Click to view the table of general integration formulas.

$\int_0^1 15e^{3x}\,dx =$ ☐ (Type an exact answer.)

4: General Integration Formulas

$\int \cos ax\,dx = \frac{1}{a}\sin ax + C$

$\int \sin ax\,dx = -\frac{1}{a}\cos ax + C$

$\int \sec^2 ax\,dx = \frac{1}{a}\tan ax + C$

$\int \csc^2 ax\,dx = -\frac{1}{a}\cot ax + C$

$\int \sec ax \tan ax\,dx = \frac{1}{a}\sec ax + C$

$\int \csc ax \cot ax\,dx = -\frac{1}{a}\csc ax + C$

$\int e^{ax}\,dx = \frac{1}{a}e^{ax} + C$

$\int b^x\,dx = \frac{1}{\ln b}b^x + C,\ b > 0,\ b \neq 1$

$\int \frac{dx}{a^2 + x^2} = \frac{1}{a}\tan^{-1}\frac{x}{a} + C$

$\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\frac{x}{a} + C,\ a > 0$

$\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a}\sec^{-1}\left|\frac{x}{a}\right| + C,\ a > 0$

Answer: $5e^3 - 5$

ID: 5.5.46

95. Use a change of variables or the table to evaluate the following definite integral.

$$\int_0^1 5x^4\left(3-x^5\right)dx$$

[5] Click to view the table of general integration formulas.

$$\int_0^1 5x^4\left(3-x^5\right)dx = \square$$ (Type an exact answer.)

5: General Integration Formulas

$$\int \cos ax\,dx = \frac{1}{a}\sin ax + C \qquad \int \sin ax\,dx = -\frac{1}{a}\cos ax + C$$

$$\int \sec^2 ax\,dx = \frac{1}{a}\tan ax + C \qquad \int \csc^2 ax\,dx = -\frac{1}{a}\cot ax + C$$

$$\int \sec ax \tan ax\,dx = \frac{1}{a}\sec ax + C \qquad \int \csc ax \cot ax\,dx = -\frac{1}{a}\csc ax + C$$

$$\int e^{ax}dx = \frac{1}{a}e^{ax} + C \qquad \int b^x dx = \frac{1}{\ln b}b^x + C,\ b>0,\ b\neq 1$$

$$\int \frac{dx}{a^2+x^2} = \frac{1}{a}\tan^{-1}\frac{x}{a} + C \qquad \int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1}\frac{x}{a} + C,\ a>0$$

$$\int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a}\sec^{-1}\left|\frac{x}{a}\right| + C,\ a>0$$

Answer: $\frac{5}{2}$

ID: 5.5.47

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

$f(x) = x^2$ between $x = 0$ and $x = 3$, using a right sum with two rectangles of equal width

- **A.** 8.4375
- **B.** 3.375
- **C.** 16.875
- **D.** 12.5

Answer: C. 16.875

ID: 5.1-1

97. Suppose that $\int_7^8 f(x)dx = -2$. Find $\int_7^8 9f(u)du$ and $\int_7^8 -f(u)du$.

- A. $-18; -\frac{1}{2}$
- B. 9; 2
- C. -18; 2
- D. 7; -2

Answer: C. -18; 2

ID: 5.2-12

98. Find the derivative.

$$\frac{d}{dx}\int_1^{\sqrt{x}} 16t^9\,dt$$

- A. $8x^{1.5}4$
- B. $\frac{16}{5}x^{3.5} - \frac{16}{5}$
- C. $\frac{32}{3}x^{3.5}$
- D. $16x^{9/2}$

Answer: A. $8x^{1.5}4$

ID: 5.3-18

99. Evaluate the integral using the given substitution.

$\int x \cos\left(6x^2\right) dx, \ u = 6x^2$

- A. $\sin\left(6x^2\right) + C$
- B. $\frac{1}{u} \sin(u) + C$
- C. $\frac{1}{12} \sin\left(6x^2\right) + C$
- D. $\frac{x^2}{2} \sin\left(6x^2\right) + C$

Answer: C. $\frac{1}{12} \sin\left(6x^2\right) + C$

ID: 5.5-1

---

100. Evaluate the following integral.

$\int \frac{dx}{x^2 - 2x + 37}$

$\int \frac{dx}{x^2 - 2x + 37} =$ ______

(Use C as the arbitrary constant as needed.)

Answer: $\frac{1}{6} \tan^{-1} \frac{x-1}{6} + C$

ID: 8.1.31

---

101. If the general solution of a differential equation is $y(t) = C e^{-4t} + 8$, what is the solution that satisfies the initial condition $y(0) = 3$?

$y(t) =$ ______

Answer: $-5 e^{-4t} + 8$

ID: 9.1.2

---

102. Find the general solution of the following equation. Express the solution explicitly as a function of the independent variable.

$t^{-8}y'(t) = 1$

y = [ ]

Answer: $\frac{t^9}{9} + C$

ID: 9.3.5

---

103. Find the general solution of the differential equation $\frac{dy}{dt} = \frac{9t^2}{8y}$.

Choose the correct answer below.

- A. $y = \pm\sqrt{\frac{4t^3}{3} + C}$
- B. $y = \frac{4t^3}{3} + C$
- C. $y = \pm\sqrt{\frac{3t^3}{4} + C}$
- D. $y = \frac{3t^3}{4} + C$

Answer: C. $y = \pm\sqrt{\frac{3t^3}{4} + C}$

ID: 9.3.7

---

104. The general solution of a first-order linear differential equation is $y(t) = Ce^{-9t} - 16$. What solution satisfies the initial condition $y(0) = 5$?

The solution is y(t) = [ ].

Answer: $21e^{-9t} - 16$

ID: 9.4.1

---

105. Find the general solution of the following equation.

$y'(t) = 5y - 4$

y(t) = ▭
(Use C as the arbitrary constant.)

Answer: $Ce^{5t} + \frac{4}{5}$

ID: 9.4.5