

Student: \_\_\_\_\_ Instructor: Alfredo Alvarez Assignment: \_\_\_\_\_  
 Date: \_\_\_\_\_ Course: Math 1314 Sullivan Coreq test3m131456spring2020

1. Solve the equation

$$3x^3 + x^2 - 12x - 4 = 0$$

Use Synthetic Division

$$\begin{array}{r|rrrr} 2 & 3 & 1 & -12 & -4 \\ & & 6 & 14 & 4 \\ \hline & 3 & 7 & 2 & 0 \end{array}$$

Possible roots:  $\pm 1, \pm 2, \pm 4$   
 First try  $2$ :  
 $\frac{24}{23} = \frac{24 \pm 2 \pm 1}{23 \pm 1 \pm 3}$   
 $2, -2, -\frac{1}{3}$

The solution set is { }

(Simplify your answer. Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

Answer:  $-\frac{1}{3}, -2, 2$

Use Synthetic Division

$$\begin{array}{r|rrrr} -2 & 3 & 7 & 2 \\ & & -6 & -2 \\ \hline & 3 & 1 & 0 \end{array}$$

$3x + 1 = 0$   
 $3x + 1 - 1 = 0 - 1$

$$3x = -1$$

$$\frac{3x}{3} = \frac{-1}{3}$$

$$x = -\frac{1}{3}$$

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2. Find the domain of the function.

$$f(x) = \sqrt{5x - 15}$$

The domain is \_\_\_\_\_. (Type your answer in interval notation.)

Answer:  $[3, \infty)$

$$f(x) = \sqrt{5x - 15}$$

domain:  
 $f(x) = \sqrt{Ax + B}$   
 set  $Ax + B \geq 0$

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set  $5x - 15 \geq 0$   
 $5x - 15 + 15 \geq 0 + 15$   
 $5x \geq 15$   
 $\frac{5x}{5} \geq \frac{15}{5}$

$$x \geq 3$$



$$[3, \infty)$$

Math Shark

3. For the given functions  $f$  and  $g$ , complete parts (a)-(h). For parts (a)-(d), also find the domain.

$f(x) = 2x + 3; g(x) = 9x - 4$

(a) Find  $(f + g)(x)$ .

$(f + g)(x) =$  \_\_\_\_\_ (Simplify your answer.)

$(f+g)(x) =$   
 $f(x) + g(x) =$   
 $(2x+3) + (9x-4) =$   
 $2x+3+9x-4 =$   
 $11x-1 =$

Domain  
 $(-\infty, \infty)$

What is the domain of  $f + g$ ? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The domain is  $\{x |$  \_\_\_\_\_  $\}$ . (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

B. The domain is  $\{x | x$  is any real number $\}$ .

(b) Find  $(f - g)(x)$ .

$(f - g)(x) =$  \_\_\_\_\_ (Simplify your answer.)

$(f-g)(x) =$   
 $f(x) - g(x) =$   
 $(2x+3) - (9x-4) =$   
 $2x+3-9x+4 =$   
 $-7x+7 =$

Domain  
 $(-\infty, \infty)$

What is the domain of  $f - g$ ? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The domain is  $\{x |$  \_\_\_\_\_  $\}$ . (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

B. The domain is  $\{x | x$  is any real number $\}$ .

(c) Find  $(f \cdot g)(x)$ .

$(f \cdot g)(x) =$  \_\_\_\_\_ (Simplify your answer.)

$(f \cdot g)(x) =$   
 $f(x) \cdot g(x) =$   
 $(2x+3)(9x-4) =$   
 $18x^2 - 8x + 27x - 12 =$   
 $18x^2 + 19x - 12 =$

Domain  
 $(-\infty, \infty)$

What is the domain of  $f \cdot g$ ? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The domain is  $\{x |$  \_\_\_\_\_  $\}$ . (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

B. The domain is  $\{x | x$  is any real number $\}$ .

(d) Find  $\left(\frac{f}{g}\right)(x)$ .

$\left(\frac{f}{g}\right)(x) =$  \_\_\_\_\_ (Simplify your answer.)

$\left(\frac{f}{g}\right)(x) =$   
 $\frac{f(x)}{g(x)} =$   
 $\frac{2x+3}{9x-4} =$

Set  $9x-4=0$   
 $9x-4+4=0+4$   
 $9x=4$   
 $\frac{9x}{9} = \frac{4}{9}$   
 $x \neq \frac{4}{9}$

Domain  
 $x \neq \frac{4}{9}$

What is the domain of  $\frac{f}{g}$ ? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A. The domain is  $\{x |$  \_\_\_\_\_  $\}$ . (Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

B. The domain is  $\{x | x$  is any real number $\}$ .

$(f+g)(x) = 11x-1$   
 $(f+g)(4) = 11(4)-1$   
 $(f+g)(4) = 44-1$   
 $(f+g)(4) = 43$

Domain

(e) Find  $(f + g)(4)$ .

$(f + g)(4) =$  \_\_\_\_\_ (Type an integer or a simplified fraction.)

$(f - g)(x) = -7x + 7$

$(f - g)(3) = -7(3) + 7$

(f) Find  $(f - g)(3)$ .

$(f - g)(3) =$  \_\_\_\_\_ (Type an integer or a simplified fraction.)

$(f \cdot g)(x) = 18x^2 + 19x - 12$

$(f \cdot g)(2) = 18(2)^2 + 19(2) - 12$

(g) Find  $(f \cdot g)(2)$ .

$(f \cdot g)(2) =$  \_\_\_\_\_ (Type an integer or a simplified fraction.)

(h) Find  $\left(\frac{f}{g}\right)(1)$ .

$(f \cdot g)(2) = 18(2)(2) + 19(2) - 12$

$(f \cdot g)(2) = 18(4) + 19(2) - 12$

$\left(\frac{f}{g}\right)(1) =$  \_\_\_\_\_ (Type an integer or a simplified fraction.)

$(f \cdot g)(2) = 72 + 38 - 12$

$(f \cdot g)(2) = 110 - 12$

Answers  $11x - 1$

B. The domain is  $\{x \mid x \text{ is any real number}\}$ .

$-7x + 7$

$(f \cdot g)(2) = 98$

B. The domain is  $\{x \mid x \text{ is any real number}\}$ .

$18x^2 + 19x - 12$

$\left(\frac{f}{g}\right)(x) = \frac{2x+3}{9x-4}$

B. The domain is  $\{x \mid x \text{ is any real number}\}$ .

$\frac{2x+3}{9x-4}$

$\left(\frac{f}{g}\right)(1) = \frac{2(1)+3}{9(1)-4}$

A. The domain is  $\left\{x \mid \underline{x \neq \frac{4}{9}}\right\}$ .

$\left(\frac{f}{g}\right)(1) = \frac{2+3}{9-4}$

(Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

43

$\left(\frac{f}{g}\right)(1) = \frac{5}{5}$

-14

98

$\left(\frac{f}{g}\right)(1) = 1$

1

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4. Find the difference quotient of  $f$ ; that is, find  $\frac{f(x+h) - f(x)}{h}$ ,  $h \neq 0$ , for the following function. Be sure to simplify.

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

$$\frac{f(x+h) - f(x)}{h} = \underline{\hspace{2cm}}$$

Answer:  $2x + h - 3$

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

$$\frac{f(x+h) - f(x)}{h} =$$

$$\frac{((x+h)^2 - 3(x+h) + 5) - (x^2 - 3x + 5)}{h} =$$

$$\frac{(x+h)(x+h) - 3x - 3h + 5 - x^2 + 3x - 5}{h} =$$

$$\frac{x^2 + 1 \times h + 1 \times h + h^2 - 3x - 3h + 5 - x^2 + 3x - 5}{h} =$$

$$\frac{x^2 + 2 \times h + h^2 - 3x - 3h + 5 - x^2 + 3x - 5}{h} =$$

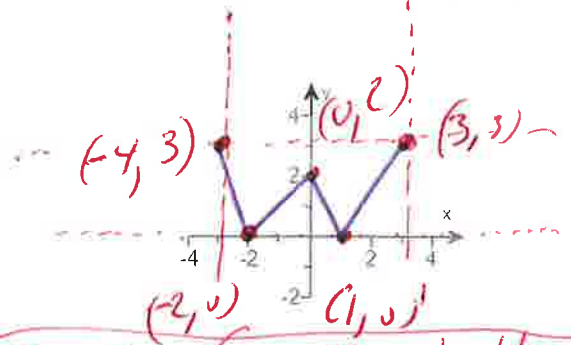
$$\frac{2 \times h + h^2 - 3h}{h} =$$

$$\frac{2 \times h}{h} + \frac{h^2}{h} - \frac{3h}{h} =$$

$$\frac{2x + h - 3}{h} =$$

5. Using the given graph of the function  $f$ , find the following.

- (a) the intercepts, if any
- (b) its domain and range
- (c) the intervals on which it is increasing, decreasing, or constant
- (d) whether it is even, odd, or neither



(a) What are the intercepts?

$(-2, 0)$   $(1, 0)$   $(0, 2)$

(Simplify your answer. Type an ordered pair. Use a comma to separate answers as needed.)

(b) The domain is  $[-3, 3]$

(Type your answer in interval notation.)

The range is  $[0, 3]$

(Type your answer in interval notation.)

Example favorite double meat double cheese, double Bacon hamburger with a diet soda

[left, right]  
[bottom, top]

(c) On which interval(s) is the graph increasing? Select the correct choice below and fill in any answer boxes within your choice.

- A. The graph is increasing on  $[-2, 0]$   $[1, 3]$   
(Type your answer in interval notation. Use a comma to separate answers as needed.)
- B. The graph is not increasing on any interval.

On which interval(s) is the graph decreasing? Select the correct choice below and fill in any answer boxes within your choice.

- A. The graph is decreasing on  $[-3, -2]$   $[0, 1]$   
(Type your answer in interval notation. Use a comma to separate answers as needed.)
- B. The graph is not decreasing on any interval.

On which interval(s) is the graph constant? Select the correct choice below and fill in any answer boxes within your choice.

- A. The graph is constant on \_\_\_\_\_  
(Type your answer in interval notation. Use a comma to separate answers as needed.)
- B. The graph is not constant on any interval.

(d) The function is (1) \_\_\_\_\_

- (1)  even.
- neither odd nor even.
- odd.

Answers  $(-2,0),(1,0),(0,2)$

$[-3,3]$

$[0,3]$

A. The graph is increasing on  $[-2,0],[1,3]$  .

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

A. The graph is decreasing on  $[-3,-2],[0,1]$  .

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

B. The graph is not constant on any interval.

(1) neither odd nor even.

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6. The function  $f$  is defined as follows.

$$f(x) = \begin{cases} 4 + 2x & \text{if } x < 0 \\ x^2 & \text{if } x \geq 0 \end{cases}$$

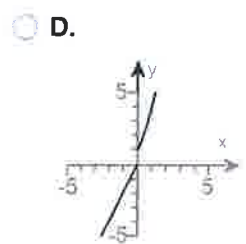
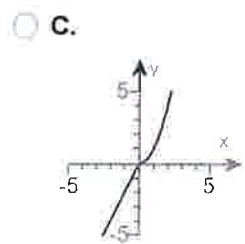
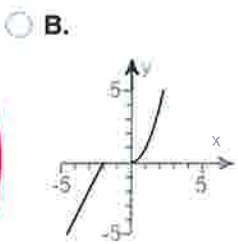
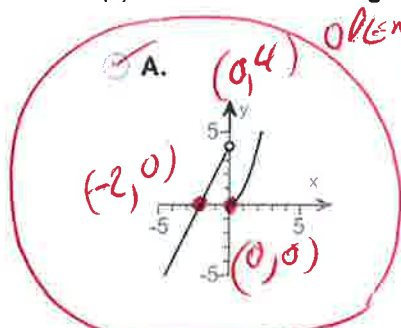
- (a) Find the domain of the function.
- (b) Locate any intercepts.
- (c) Graph the function.
- (d) Based on the graph, find the range.

(a) The domain of the function  $f$  is  $(-\infty, \infty)$  ← (left, right)  
 (Type your answer in interval notation.)

(b) Locate any intercepts. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The intercept(s) is/are  $(-2, 0)$   $(0, 0)$  ←  $x$ -intercept  $(0, 0)$  ←  $y$ -intercept (Both)
- B. There are no intercepts.

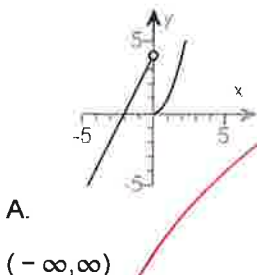
(c) Choose the correct graph of  $f(x)$  below.



(d) The range of the function  $f$  is  $(-\infty, \infty)$  ← (bottom, top)  
 (Type your answer in interval notation.)

Answers  $(-\infty, \infty)$

A. The intercept(s) is/are  $(-2, 0), (0, 0)$ .  
 (Type an ordered pair. Use a comma to separate answers as needed.)



windows  
 $x$ -min = -12  
 $x$ -max = 12  
 $y$ -min = -10  
 $y$ -max = 10

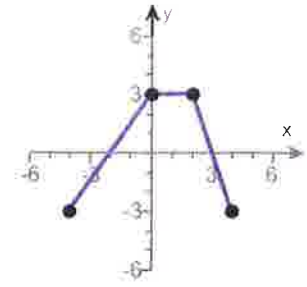
Use graphing calculator

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2ND Math

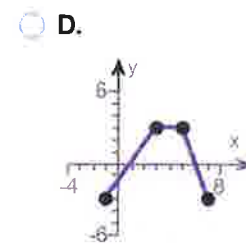
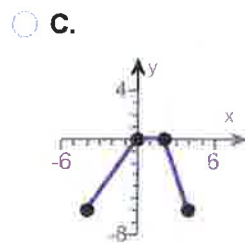
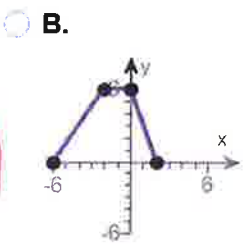
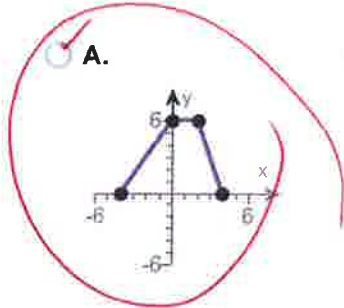
$y_1 = 4 + 2x$  ÷ ( $x < 0$ ) 2ND Math Circle  
 $y_2 = x^2$  ÷ ( $x \geq 0$ ) Close Circle

7. The graph of a function  $f$  is illustrated to the right. Use the graph of  $f$  as the first step toward graphing each of the following functions.

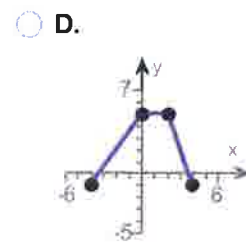
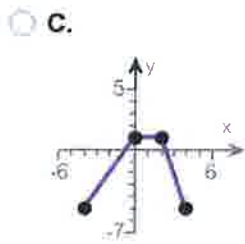
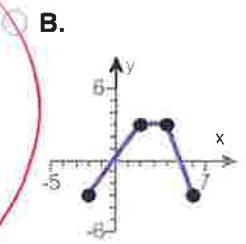
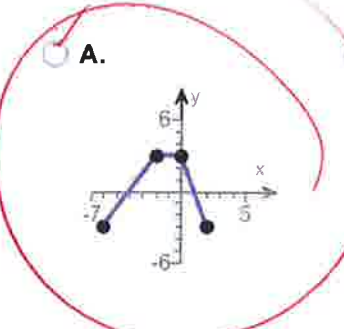


- (a)  $F(x) = f(x) + 3$       (b)  $G(x) = f(x + 2)$       (c)  $P(x) = -f(x)$   
 (d)  $H(x) = f(x + 1) - 1$       (e)  $Q(x) = \frac{1}{3}f(x)$       (f)  $g(x) = f(-x)$   
 (g)  $h(x) = f(2x)$

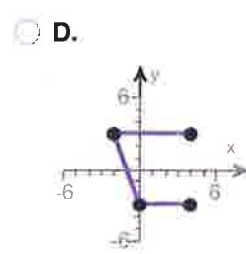
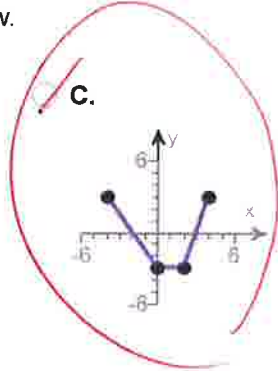
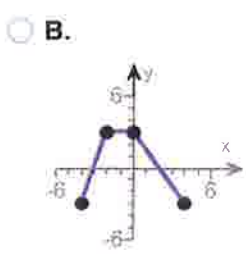
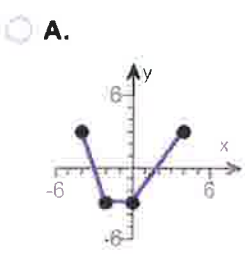
(a) Choose the correct graph of  $F(x) = f(x) + 3$  below.



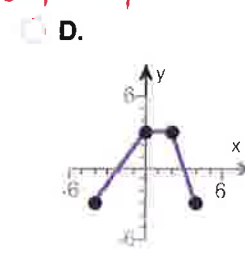
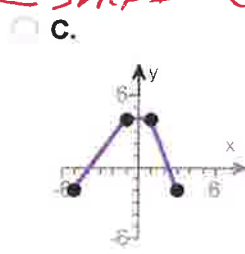
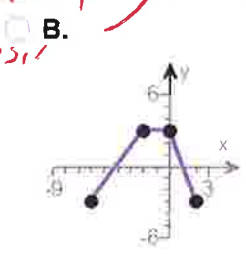
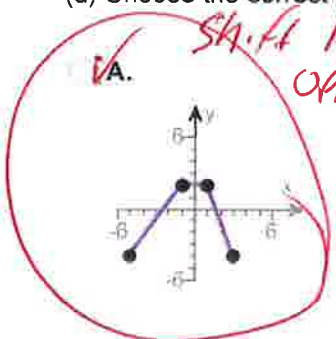
(b) Choose the correct graph of  $G(x) = f(x + 2)$  below.



(c) Choose the correct graph of  $P(x) = -f(x)$  below.



(d) Choose the correct graph of  $H(x) = f(x + 1) - 1$  below.

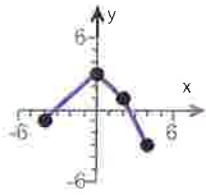


*Shift left -1*      *Shift down -1*  
*Opposite*

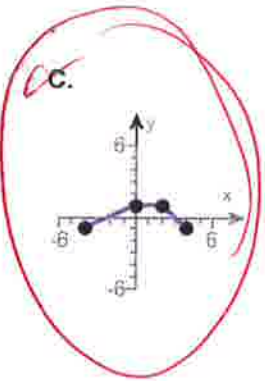
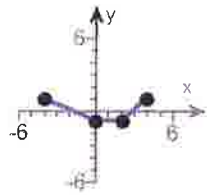


(e) Choose the correct graph of  $Q(x) = \frac{1}{3}f(x)$  below.

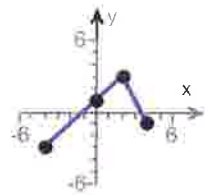
A.



B.

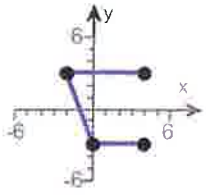


D.

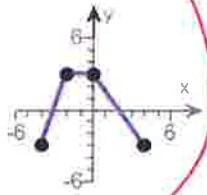


(f) Choose the correct graph of  $g(x) = f(-x)$  below.

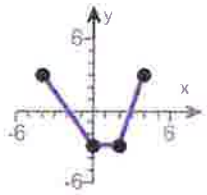
A.



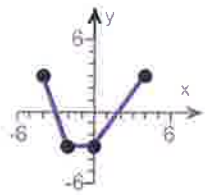
B.



C.

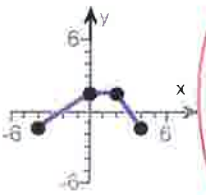


D.

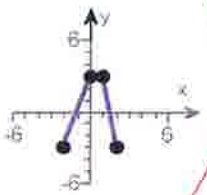


(g) Choose the correct graph of  $h(x) = f(2x)$  below.

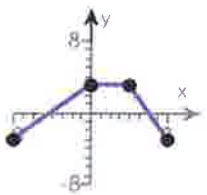
A.



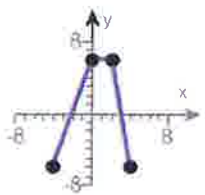
B.



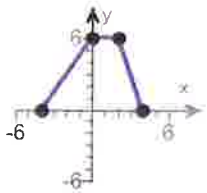
C.



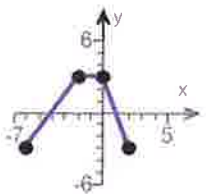
D.



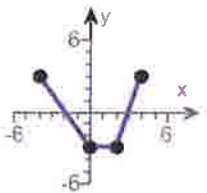
Answers



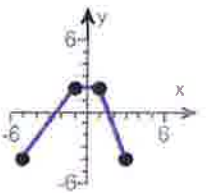
A.



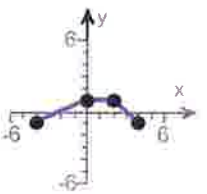
A.



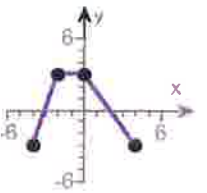
C.



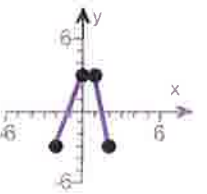
A.



C.



B.



B.

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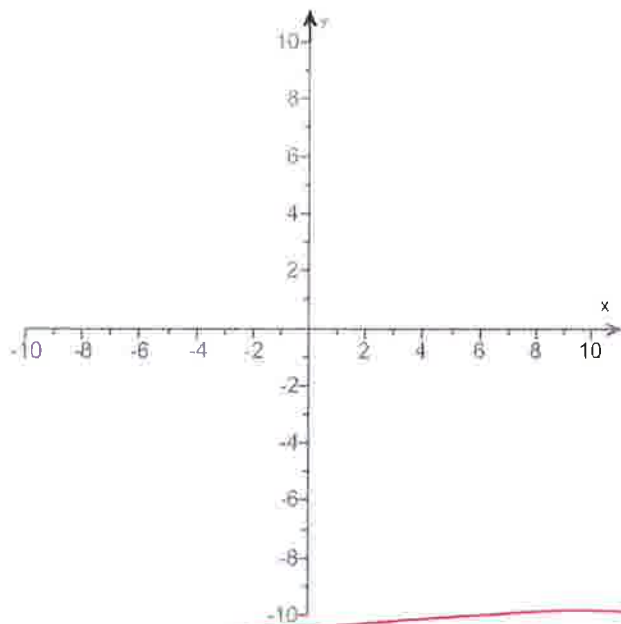
8.

- (a) Graph  $f(x) = |x + 5| - 4$  using transformations.
- (b) Find the area of the region bounded by  $f$  and the x-axis that lies below the x-axis.

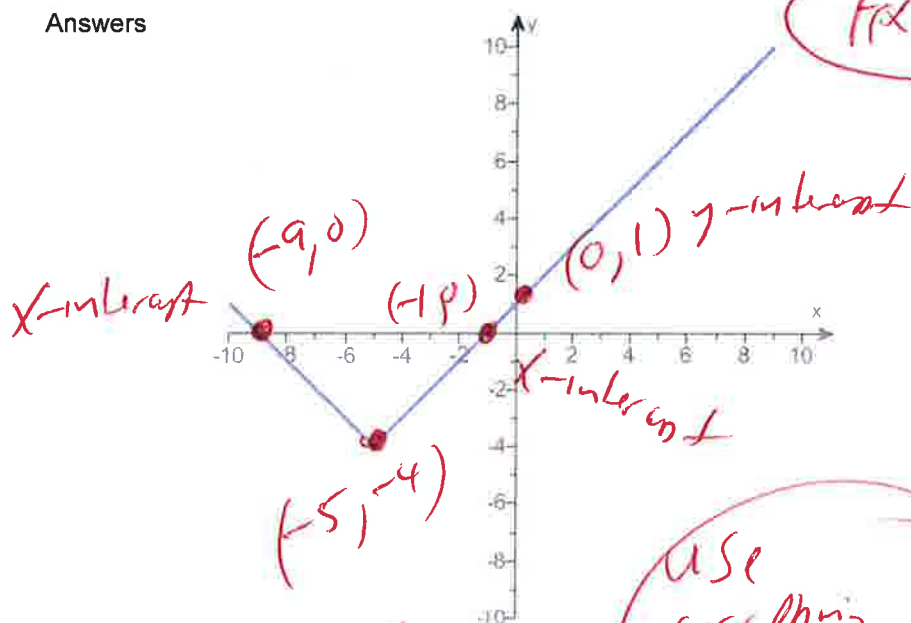
(a) Graph  $f(x)$ .

(Use the graphing tool provided to graph the function.)

- (b) The area of the region bounded by  $f$  and the x-axis that lies below the x-axis is \_\_\_\_\_ square units.  
(Simplify your answer.)



Answers



$f(x) = |x + 5| - 4$

X	f(x)
-9	0
-5	-4
-1	0
0	1

use graphing calculator

16

ID: 1.5.81

Windows  
 $x$ -min = -12  
 $x$ -max = 12  
 $y$ -min = -10  
 $y$ -max = 10

$y_1 = \text{Math, Num, abs}$

$y_1 = \text{abs}(x + 5) - 4$   
 Shift left -5      (Shift down -4)

9  
NEXT Page



For the quadratic function  $f(x) = x^2 + 2x - 8$ , answer parts (a) through (c).

(a) Graph the quadratic function by determining whether its graph opens up or down and by finding its vertex, axis of symmetry, y-intercept, and x-intercepts, if any.

Does the graph of  $f$  open up or down?

- down  
 up

What are the coordinates of the vertex?

The vertex of the parabola is \_\_\_\_\_.  
 (Type an ordered pair. Use integers or fractions for any numbers in the expression.)

What is the equation of the axis of symmetry?

The axis of symmetry is \_\_\_\_\_.  
 (Type an equation.)

What is/are the x-intercept(s)? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The x-intercept(s) is/are \_\_\_\_\_.  
 (Type an integer or a decimal. Use a comma to separate answers as needed.)  
 B. There are no x-intercepts.

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

- A. The y-intercept is \_\_\_\_\_.  
 (Type an integer or a decimal.)  
 B. There is no y-intercept.

Use the graphing tool to graph the function.

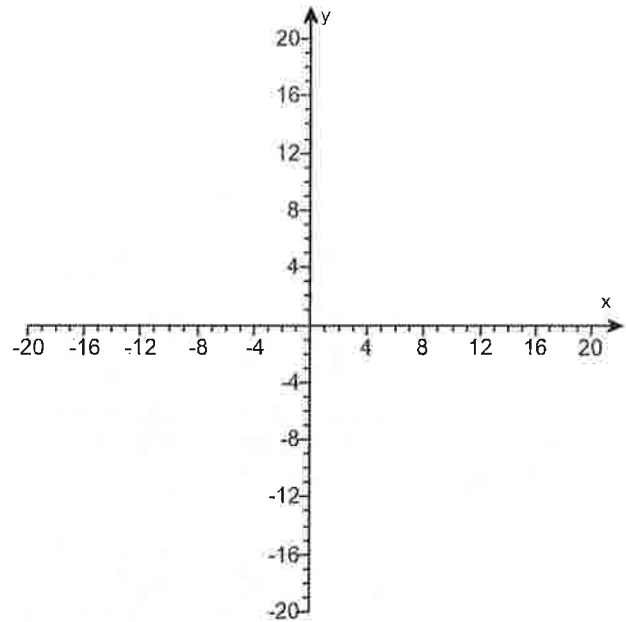
(b) Determine the domain and the range of the function.

The domain of  $f$  is \_\_\_\_\_.  
 (Type your answer in interval notation.)

The range of  $f$  is \_\_\_\_\_.  
 (Type your answer in interval notation.)

(c) Determine where the function is increasing and where it is decreasing.

The function is increasing on the interval



Example Swimming in the ocean at 236 am on Saturday night by yourself

Answers up

(-1, -9)

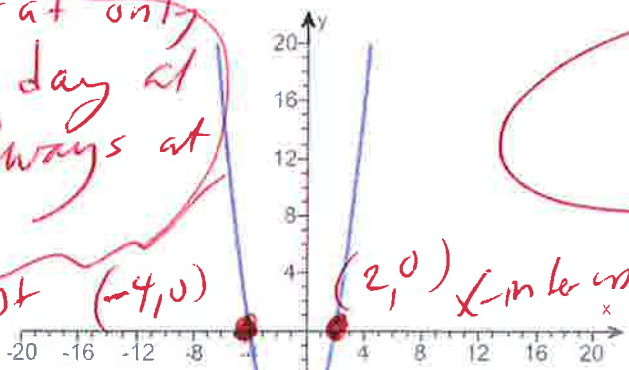
x = -1

A. The x-intercept(s) is/are -4, 2

(Type an integer or a decimal. Use a comma to separate answers as needed.)

A. The y-intercept is -8. (Type an integer or a decimal.)

Good news Shark eat only in the day at sleep always at night.



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

x	f(x)
-4	0
-1	-9
0	-8
2	0

(-4, 0) x-intercept  
(2, 0) x-intercept  
(0, -8) y-intercept  
(-1, -9) vertex min

vertex you find the vertex

- (-∞, ∞)
- [-9, ∞)
- [-1, ∞)
- (-∞, -1]

Window

x-min = -12  
x-max = 12  
y-min = -10  
y-max = 10

Use graphing calculator

ID: 2.4.37

$y_1 = x^2 + 2x - 8$   
BIG

10. Find the vertical, horizontal, and oblique asymptotes, if any, for the following rational function.

$R(x) = \frac{2x}{x+2}$

Set bottom = 0  $x+2=0$   
 $x+2-2=0-2$   
 $x=-2$   
 $R(x) = \frac{2x}{x+2}$

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

- A. The vertical asymptote(s) is/are  $x =$  \_\_\_\_\_  
(Use a comma to separate answers as needed.)
- B. There is no vertical asymptote. *Vertical asymptote  $x = -2$*

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

- A. The horizontal asymptote(s) is/are  $y =$  \_\_\_\_\_  
(Use a comma to separate answers as needed.)
- B. There is no horizontal asymptote. *Highest power top =  $\frac{2x}{x}$   
Highest power bottom =  $\frac{2}{1}$*

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

- A. The oblique asymptote(s) is/are  $y =$  \_\_\_\_\_  
(Use a comma to separate answers as needed.)
- B. There is no oblique asymptote. *Oblique asymptote  $y = 2$*

Answers A. The vertical asymptote(s) is/are  $x =$  -2  
(Use a comma to separate answers as needed.)

A. The horizontal asymptote(s) is/are  $y =$  2  
(Use a comma to separate answers as needed.)

B. There is no oblique asymptote.

ID: 3.4.45 *Since highest power on top is same as highest power on the bottom then there is no oblique asymptote*

11. For  $f(x) = 7x + 5$  and  $g(x) = 8x$ , find the following composite functions and state the domain of each.

- (a)  $f \circ g$       (b)  $g \circ f$       (c)  $f \circ f$       (d)  $g \circ g$

(a)  $(f \circ g)(x) =$  \_\_\_\_\_ (Simplify your answer.)

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

- A. The domain of  $f \circ g$  is  $\{x \mid$  \_\_\_\_\_  $\}$ .  
(Type an inequality. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain of  $f \circ g$  is all real numbers.

(b)  $(g \circ f)(x) =$  \_\_\_\_\_ (Simplify your answer.)

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

- A. The domain of  $g \circ f$  is  $\{x \mid$  \_\_\_\_\_  $\}$ .  
(Type an inequality. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain of  $g \circ f$  is all real numbers.

(c)  $(f \circ f)(x) =$  \_\_\_\_\_ (Simplify your answer.)

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

- A. The domain of  $f \circ f$  is  $\{x \mid$  \_\_\_\_\_  $\}$ .  
(Type an inequality. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain of  $f \circ f$  is all real numbers.

(d)  $(g \circ g)(x) =$  \_\_\_\_\_ (Simplify your answer.)

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

- A. The domain of  $g \circ g$  is  $\{x \mid$  \_\_\_\_\_  $\}$ .  
(Type an inequality. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)
- B. The domain of  $g \circ g$  is all real numbers.



Answers  $56x + 5$ B. The domain of  $f \circ g$  is all real numbers.

$56x + 40$

B. The domain of  $g \circ f$  is all real numbers.

$49x + 40$

B. The domain of  $f \circ f$  is all real numbers.

$64x$

B. The domain of  $g \circ g$  is all real numbers.

ID: 4.1.23

(11) a  $f(x) = 7x + 5$  and  $g(x) = 8x$  *inside here*

$(f \circ g)(x) =$

$f(g(x)) =$

$f(8x) =$

$7(8x) + 5 =$

$56x + 5 =$

Domain  
 $(-\infty, \infty)$

(11) b  $f(x) = 7x + 5$  and  $g(x) = 8x$  *inside here*

$(g \circ f)(x) =$

$g(f(x)) =$

$g(7x + 5) =$

$8(7x + 5) =$

$56x + 40 =$

Domain  
 $(-\infty, \infty)$

12

11) c  $f(x) = 7x + 5$  and  $g(x) = 8x$

*inside itself*

$$(f \circ f)(x) =$$

$$f(f(x)) =$$

$$f(7x + 5) =$$

$$7(7x + 5) + 5 =$$

$$49x + 35 + 5 =$$

$$49x + 40 =$$

domain  
 $(-\infty, \infty)$

11)  $f(x) = 7x + 5$  and  $g(x) = 8x$

*inside itself*

$$(g \circ g)(x) =$$

$$g(g(x)) =$$

$$g(8x) =$$

$$8(8x) =$$

$$64x =$$

domain  
 $(-\infty, \infty)$

12

The function  $f(x) = 8x + 4$  is one-to-one.

- (a) Find the inverse of  $f$  and check the answer.
- (b) Find the domain and the range of  $f$  and  $f^{-1}$ .
- (c) Graph  $f$ ,  $f^{-1}$ , and  $y = x$  on the same coordinate axes.

(a)  $f^{-1}(x) =$  \_\_\_\_\_

(Simplify your answer. Use integers or fractions for any numbers in the expression.)

(b) Find the domain of  $f$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is  $\{x \mid x \neq \text{_____}\}$ .
- B. The domain is  $\{x \mid x \geq \text{_____}\}$ .
- C. The domain is  $\{x \mid x \leq \text{_____}\}$ .
- D. The domain is the set of all real numbers.

Find the range of  $f$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

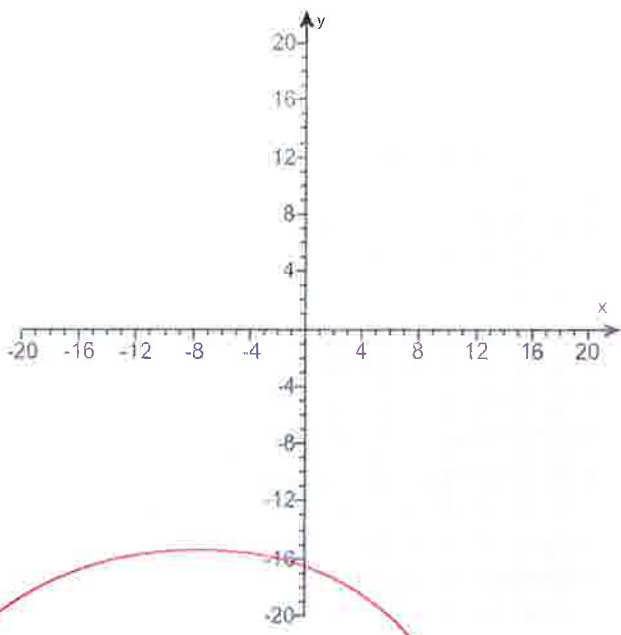
- A. The range is  $\{y \mid y \geq \text{_____}\}$ .
- B. The range is  $\{y \mid y \leq \text{_____}\}$ .
- C. The range is  $\{y \mid y \neq \text{_____}\}$ .
- D. The range is the set of all real numbers.

Find the domain of  $f^{-1}$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The domain is  $\{x \mid x \neq \text{_____}\}$ .
- B. The domain is  $\{x \mid x \leq \text{_____}\}$ .
- C. The domain is  $\{x \mid x \geq \text{_____}\}$ .
- D. The domain is the set of all real numbers.

Find the range of  $f^{-1}$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The range is  $\{y \mid y \leq \text{_____}\}$ .
- B. The range is  $\{y \mid y \geq \text{_____}\}$ .
- C. The range is  $\{y \mid y \neq \text{_____}\}$ .
- D. The range is the set of all real numbers.



Handwritten work in red ink:

$$f(x) = 8x + 4$$

$$y = 8x + 4$$

inverse  $x - 4$

$$x = 8y + 4$$

Solve for  $y$

$$x - 4 = 8y + 4 - 4$$

$$x - 4 = 8y$$

$$\frac{x - 4}{8} = \frac{8y}{8}$$

$$\frac{x - 4}{8} = y$$

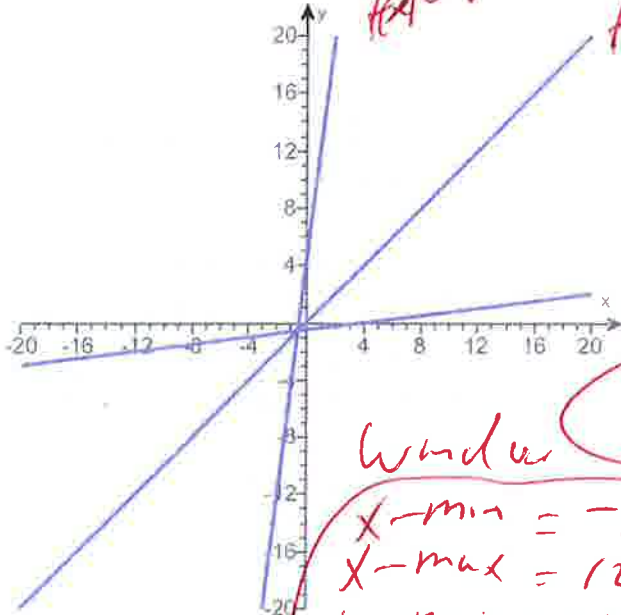
$$y = \frac{x - 4}{8}$$

inverse

$$f^{-1}(x) = \frac{x - 4}{8}$$

Answers  $\frac{x-4}{8}$

- D. The domain is the set of all real numbers.
- D. The range is the set of all real numbers.
- D. The domain is the set of all real numbers.
- D. The range is the set of all real numbers.



$y_1 = 8x + 4$  ✓  
 $y_2 = x$  ✓

inverse  
 $f^{-1}(x) = (x-4) \div (8)$  ✓

$y_3 = (x-4) \div (8)$

Wunder  
 $x_{min} = -12$   
 $x_{max} = 12$   
 $y_{min} = -10$   
 $y_{max} = 10$

use graphing calculator

ID: 4.2.53

13. Solve the equation.

$8^{-x+21} = 16^x$

$(2^3)^{-x+21} = (2^4)^x$  rewrite  
 Primes 2, 3, 5, 7, 11, 13

The solution set is { }.

(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

Answer: 9

$2^{-3x+63} = 2^{4x}$

$-3x + 63 = 4x$

$-3x + 63 - 63 = 4x - 63$

$-3x = 4x - 63$

$-3x - 4x = 4x - 63 - 4x$

$-7x = -63$

$\frac{-7x}{-7} = \frac{-63}{-7}$

$x = 9$  ✓

2|8 2|16  
 2|4 2|8  
 2|2 2|4  
 1 2|2  
 1

$8 = 2 \cdot 2 \cdot 2$   
 $8 = 2^3$

$16 = 2 \cdot 2 \cdot 2 \cdot 2$

$16 = 2^4$

14. Find the domain of the function.

$g(x) = \ln(x - 9)$

The domain of  $g$  is \_\_\_\_\_  
(Type your answer in interval notation.)

Answer:  $(9, \infty)$

ID: 4.4.39

*set*  $x - 9 > 0$   
 $x - 9 + 9 > 0 + 9$   
 $x > 9$   
  
 $(9, \infty)$

*formula domain*  
 $f(x) = \ln(Ax + B)$   
*set*  $Ax + B > 0$

15. Solve the equation.

$\log_2(2x + 5) = 4$

Change the given logarithmic equation to exponential form.

\_\_\_\_\_ (Type an equation. Do not simplify.)

The solution set is {\_\_\_\_\_}

(Simplify your answer. Use a comma to separate answers as needed.)

Answers  $2x + 5 = 2^4$

$\frac{11}{2}$

*formula use on log of f*  
 $\log_2(2x + 5) = 4$   
*rewrite*  
 $2^4 = 2x + 5$   
 $2 \cdot 2 \cdot 2 \cdot 2 = 2x + 5$   
 $16 = 2x + 5$   
 $16 - 5 = 2x + 5 - 5$   
 $11 = 2x$   
 $\frac{11}{2} = \frac{2x}{2}$   
 $\frac{11}{2} = x$

ID: 4.4.91-Setup & Solve

16. The formula

$D = 50e^{-0.5h}$

can be used to find the number of milligrams  $D$  of a certain drug that is in a patient's bloodstream  $h$  hours after the drug was administered. When the number of milligrams reaches 3, the drug is to be administered again. What is the time between injections?

The time between injections is \_\_\_\_\_ hour(s).

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

Answer: 5.63

$3 = 50e^{-0.5h}$   
 $\frac{3}{50} = \frac{50e^{-0.5h}}{50}$   
 $0.06 = e^{-0.5h}$   
 $\ln(0.06) = \ln(e^{-0.5h})$   
 $\ln(0.06) = -0.5h \ln(e)$   
 $\ln(0.06) = -0.5h(1)$   
 $\ln(0.06) = -0.5h$   
 $\frac{\ln(0.06)}{-0.5} = \frac{-0.5h}{-0.5}$   
 $5.626821437 = h$   
*OR*  
 $5.63 = h$  *Round*

ID: 4.4.125

*formula*  $\ln(e) = 1$   
 $\ln(A^N) = N \ln(A)$

17. Write the expression as a sum and/or difference of logarithms. Express powers as factors.

$\log \left[ \frac{x(x+4)}{(x+3)^6} \right], x > 0$   
 $\rightarrow \log(x(x+4)) - \log(x+3)^6 =$   
 $\log(x) + \log(x+4) - \log(x+3)^6 =$   
 $\log \left[ \frac{x(x+4)}{(x+3)^6} \right] =$  (Simplify your answer.)  
 $\log(x) + \log(x+4) - 6 \log(x+3) =$

Answer:  $\log x + \log(x+4) - 6 \log(x+3)$

formulas

$\log\left(\frac{A}{B}\right) = \log(A) - \log(B)$

$\log A^N = N \log A$

ID: 4.5.51

$\log(AB) = \log(A) + \log(B)$

18. Solve the logarithmic equation.

$\log x + \log(x+9) = 1$

Determine the equation to be solved after removing the logarithm.

(Type an equation. Do not simplify.)

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

A. The solution set is { }.

(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

B. There is no solution.

Answers  $x(x+9) = 10$

A. The solution set is { 1 }.

(Simplify your answer. Type an exact answer. Use a comma to separate answers as needed.)

ID: 4.6.17-Setup & Solve

$\log(x) + \log(x+9) = 1$

$\log(1) + \log(10) = 1$

$\log(1) + \log(10) = 1$

Good Good

$\log(-10) + \log(10+9) = 1$

$\log(-10) + \log(-1) = 1$

BAD BAD

ANSWER  
 $x = 1$   
only

19. Solve the following exponential equation. Express irrational solutions in exact form and as a decimal rounded to three decimal places.

$3^{x-1} = 9$

$3^{x-1} = 3^2$  rewrite  
 $x-1 = 2$

OR  
 $\ln(3^{x-1}) = \ln(9)$   
 $(x-1)\ln(3) = \ln(9)$   
 $\frac{(x-1)\ln(3)}{\ln(3)} = \frac{\ln(9)}{\ln(3)}$   
 $x-1 = \frac{\ln(9)}{\ln(3)}$

formula  
 $\ln(A^B) = B \ln(A)$

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

A. The solution set is { 3 }.  
 (Simplify your answer. Type an exact answer.)

B. There is no solution.

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

A. The solution set is { 3.000 }.  
 (Simplify your answer. Type an integer or decimal rounded to three decimal places as needed.)

B. There is no solution.

Answers A. The solution set is { 3 }. (Simplify your answer. Type an exact answer.)

A. The solution set is { 3.000 }.  
 (Simplify your answer. Type an integer or decimal rounded to three decimal places as needed.)

$x = 3$

ID: 4.6.41

20. Find the amount that results from the given investment.

\$600 invested at 4% compounded quarterly after a period of 4 years

After 4 years, the investment results in \$  
 (Round to the nearest cent as needed.)

Answer: 703.55

formula  
 $A = P(1 + \frac{r}{n})^{nt}$   
 $A = \$600(1 + \frac{0.04}{4})^{(4)(4)}$   
 $A = \$600(1 + \frac{0.04}{4})^{16}$

$P = 600$   
 $r = 4\% = 0.04$   
 $n = 4 = \text{Quarterly}$   
 $t = 4 = \text{YEAR}$

ID: 4.7.7

$A = \$600(1 + \frac{0.04}{4})^{16}$   
 $A = 703.547187$   
 $A = 703.55$  Round

21. Solve the system of equations. If the system has no solution, say that it is inconsistent.

$$\begin{cases} 4x - 5y = -7 \\ 5x + y = 13 \end{cases}$$

*Mult*

$$\begin{array}{r} (1) \quad 4x - 5y = -7 \\ (5) \quad 25x + 5y = 65 \\ \hline 29x + 0 = 58 \end{array}$$

$$\begin{array}{r} 29x = 58 \\ \hline \frac{29x}{29} = \frac{58}{29} \\ x = 2 \end{array}$$

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

- A. The solution of the system is  $x =$  \_\_\_\_\_ and  $y =$  \_\_\_\_\_. (Type an integers or simplified fractions.)
- B. There are infinitely many solutions. Using ordered pairs, the solution can be written as  $\{(x,y) | x =$  \_\_\_\_\_,  $y$  any real number $\}$ . (Simplify your answer. Type an expression using  $y$  as the variable as needed.)
- C. The system is inconsistent.

*Subst*

$$\begin{array}{r} 4x - 5y = -7 \\ 4(2) - 5y = -7 \\ 8 - 5y = -7 \\ -5y - 8 = -7 - 8 \\ -5y - 8 = -15 \\ -5y = -15 \\ \frac{-5y}{-5} = \frac{-15}{-5} \\ y = 3 \end{array}$$

Answer: A. The solution of the system is  $x =$  2 and  $y =$  3. (Type an integers or simplified fractions.)

ID: 6.1.33

$(x, y) = (2, 3)$

22. Solve the given system of equations. If the system has no solution, say that it is inconsistent.

$$\begin{cases} x - 3y + 4z = 12 \\ 2x + y + z = -4 \\ -2x + 3y - 3z = -8 \end{cases}$$

*2nd Matrix, edit, [A], 3x4, enter*

$$[A] = \begin{bmatrix} 1 & -3 & 4 & 12 \\ 2 & 1 & 1 & -4 \\ -2 & 3 & -3 & -8 \end{bmatrix}$$

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

- A. The solution is  $x =$  \_\_\_\_\_,  $y =$  \_\_\_\_\_, and  $z =$  \_\_\_\_\_. (Type integers or simplified fractions.)
- B. There are infinitely many solutions. Using ordered triplets, they can be expressed as  $\{(x,y,z) | x =$  \_\_\_\_\_,  $y =$  \_\_\_\_\_,  $z$  any real number $\}$ . (Simplify your answers. Type expressions using  $z$  as the variable as needed.)
- C. There are infinitely many solutions. Using ordered triplets, they can be expressed as  $\{(x,y,z) | x =$  \_\_\_\_\_,  $y$  any real number,  $z$  any real number $\}$ . (Simplify your answer. Type an expression using  $y$  and  $z$  as the variables as needed.)
- D. The system is inconsistent. *2nd, Matrix, Math, rref()*

Answer: A.

The solution is  $x =$  -2,  $y =$  -2, and  $z =$  2. (Type integers or simplified fractions.)

ID: 6.1.45

*rref([A]) =*

*2nd Matrix(A)*

$$\begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 2 \end{bmatrix} \quad (x, y, z) = (-2, -2, 2)$$



23. Find the sum of the sequence.

$$\sum_{k=1}^4 (8k+2)$$

$$\sum_{k=1}^4 (8k+2) = (8+2) + (16+2) + (24+2) + (32+2) =$$

$$(10) + (18) + (26) + (34) =$$

Answer: 88

ID: 7.1.73

24. Expand the expression using the binomial theorem.

$$\sum_{k=0}^5 \binom{5}{k} (x)^k (3)^{5-k} = \binom{5}{0} (x)^0 (3)^5 + \binom{5}{1} (x)^1 (3)^4 + \binom{5}{2} (x)^2 (3)^3 + \binom{5}{3} (x)^3 (3)^2 + \binom{5}{4} (x)^4 (3)^1 + \binom{5}{5} (x)^5 (3)^0 =$$

$$(1)(x^0)(1) + (5)(x^1)(3) + (10)(x^2)(9) + (10)(x^3)(27) + (5)(x^4)(81) + (1)(1)(243) =$$

Answer:  $x^5 + 15x^4 + 90x^3 + 270x^2 + 405x + 243$

ID: 7.5.17

25. Find the real solutions of the equation.

$$2 + \sqrt{3x-2} = x$$

$$\sqrt{3x-2} = x-2 \quad \text{Rewrite}$$

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

- A. The solution set is {\_\_\_\_\_}.  
(Simplify your answer. Use a comma to separate answers as needed.)
- B. The solution is the empty set.

Answer: A. The solution set is { 6 }.

(Simplify your answer. Use a comma to separate answers as needed.)

ID: A.8.55

$$(\sqrt{3x-2})^2 = (x-2)^2 \quad \text{Square both sides}$$

$$3x-2 = (x-2)(x-2)$$

$$3x-2 = x^2 - 2x - 2x + 4$$

$$3x-2 = x^2 - 4x + 4$$

$$0 = x^2 - 4x + 4 - 3x + 2$$

$$0 = x^2 - 7x + 6$$

(25) Part 2  $x^2 - 7x + 6 = 0$

$$(x-1)(x-6) = 0$$

$$x-1=0 \quad \text{OR} \quad x-6=0$$

$$x-1+1=0+1 \quad \text{OR} \quad x-6+6=0+6 \quad \text{Check}$$

~~$x=1$~~  OR  $x=6$  ✓ check ✓

---

$$2 + \sqrt{3x-2} = x$$

~~Try  $x=1$~~

$$2 + \sqrt{3(1)-2} = (1)$$

$$2 + \sqrt{3-2} = 1$$

$$2 + \sqrt{1} = 1$$

$$2 + 1 = 1$$

$3 \neq 1$  BAD

---

$$2 + \sqrt{3x-2} = x$$

Try  $x=6$

$$2 + \sqrt{3(6)-2} = (6)$$

$$2 + \sqrt{18-2} = 6$$

$$2 + \sqrt{16} = 6$$

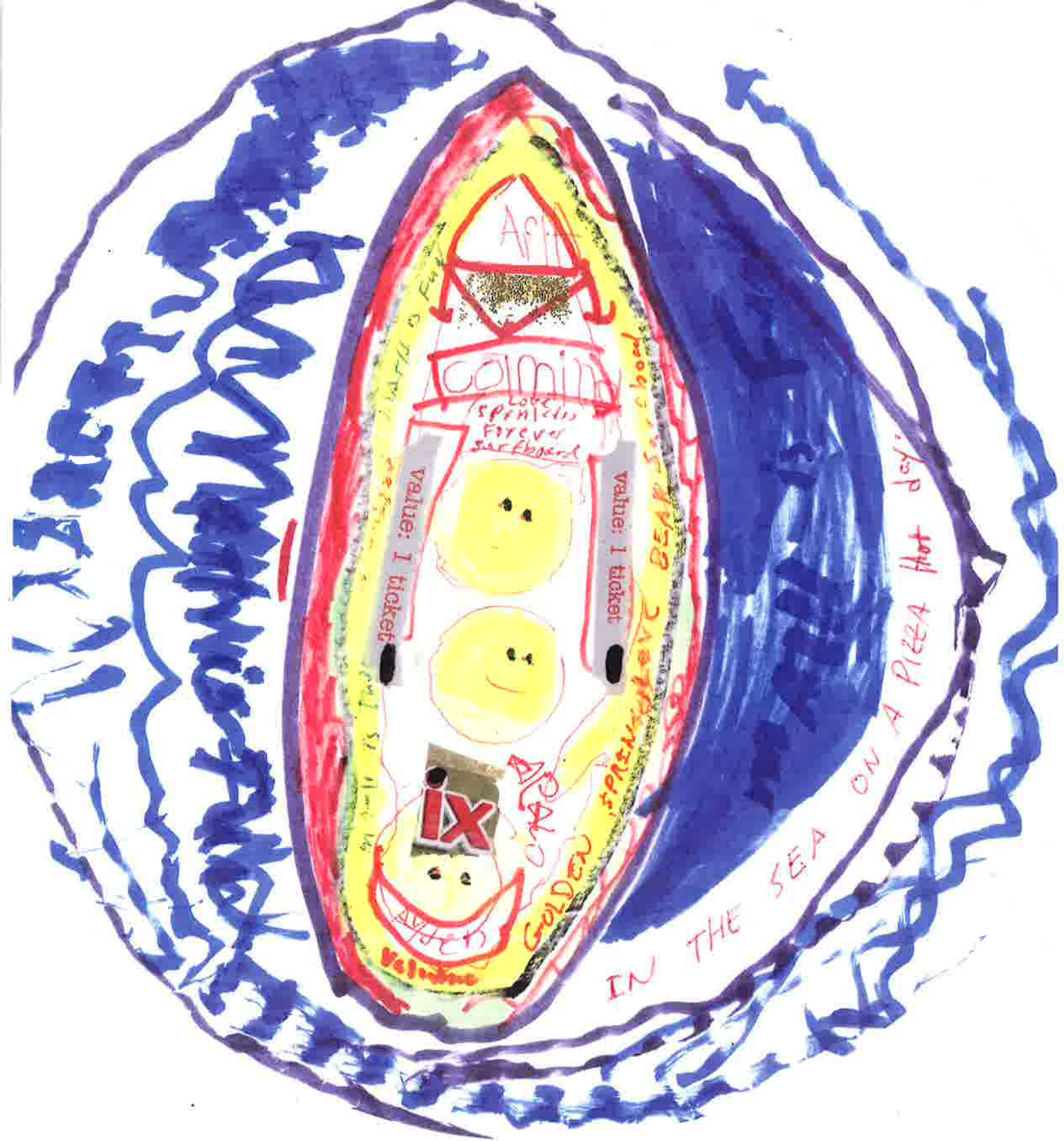
$$2 + 4 = 6$$

$$6 = 6$$

answer ✓  
 $x=6$   
only ✓

Good

---





$$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12}, \quad \frac{2}{4} \times \frac{3}{3} = \frac{6}{12}$$



SMART Bird

5-8-17  
MARI

$$\frac{4}{12} + \frac{6}{12} = \frac{10}{12} = \frac{5}{6}$$

$$\frac{12}{12} - \frac{10}{12} = \frac{2}{12} \text{ or } \frac{1}{6}$$

MARI MARI MARI



MATH is  
FUN

# BROKEN SURFBOARD



121119.A112



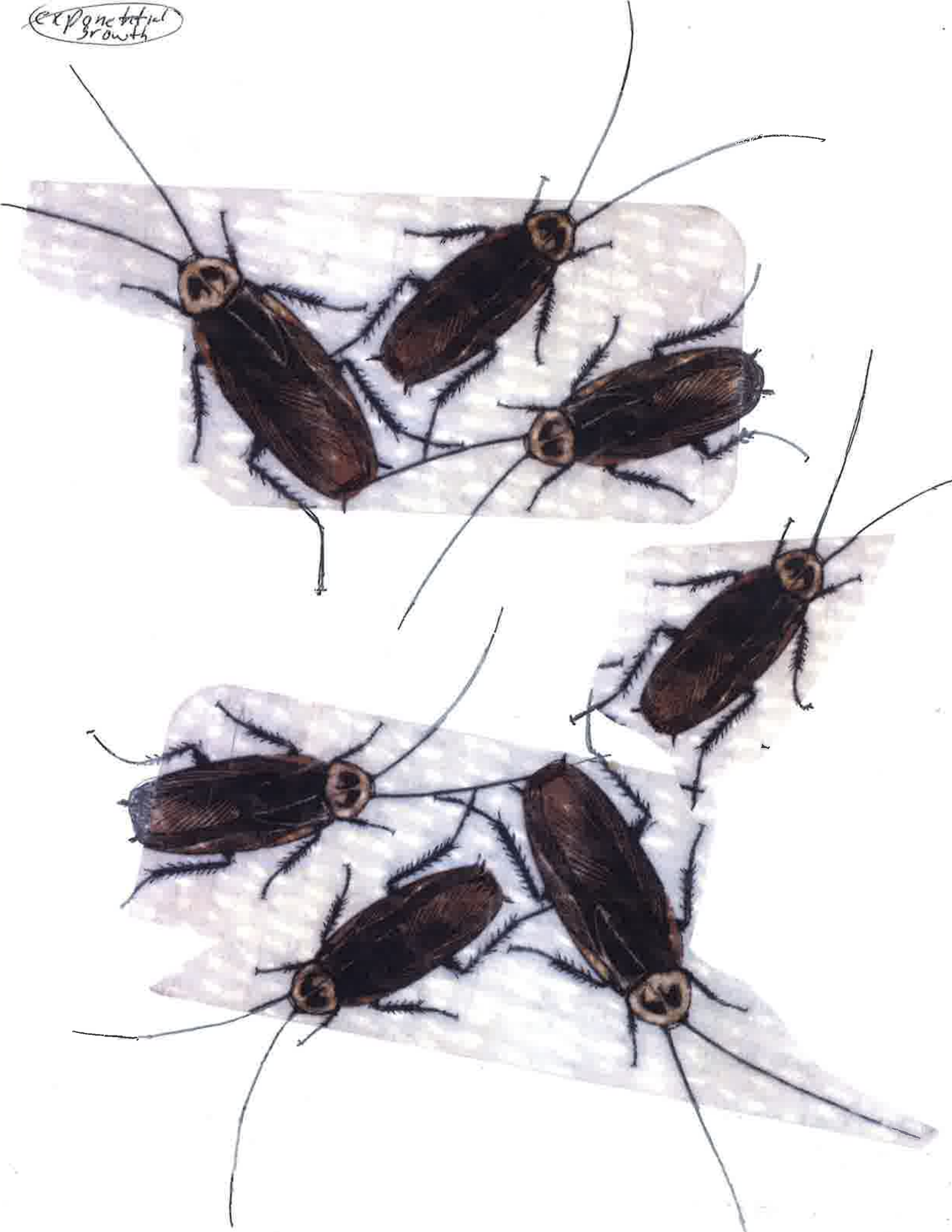
(exponential growth)



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exponential  
growth



090315m