

Student: _____

Instructor: Alfredo Alvarez

Assignment:

Date: _____

Course: Math 1314 Sullivan Coreq

finalm1314kellymathrules40

1. Solve the equation.

$$8x^3 + x^2 - 72x - 9 = 0$$

The solution set is { }

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

Answer: $-\frac{1}{8}, -3, 3$

Use Synthetic Division

$$\begin{array}{r|rrrr} 3 & 8 & 1 & -72 & -9 \\ & & 24 & 75 & 9 \\ \hline & 8 & 25 & 3 & 0 \text{ rem} \end{array}$$

Use Synthetic Division

$$\begin{array}{r|rrrr} -3 & 8 & 25 & 3 & \\ & & -24 & -3 & \\ \hline & 8 & 1 & 0 & \text{rem} \end{array}$$

$8x + 1 = 0$
 $8x + 1 - 1 = 0 - 1$

Factor by grouping

$$8x^3 + x^2 - 72x - 9 = (8x^3 - 72x) + (x^2 - 9)$$

$$= 8x(x^2 - 9) + (x^2 - 9)$$

$$= (8x + 1)(x^2 - 9)$$

$$= (8x + 1)(x - 3)(x + 3)$$

$8x + 1 = 0 \Rightarrow 8x = -1 \Rightarrow x = -\frac{1}{8}$

$x^2 - 9 = 0 \Rightarrow x^2 = 9 \Rightarrow x = \pm 3$

Answers: $-\frac{1}{8}, -3, 3$

ID: PF.4.39

2. Find the distance $d(P_1, P_2)$ between the given points

P_1 and P_2 .

$P_1 = (3, 1)$

$P_2 = (-5, 2)$

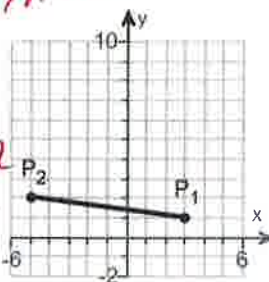
Formula

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$d = \sqrt{(3 - (-5))^2 + (1 - 2)^2}$$

$$d = \sqrt{(3 + 5)^2 + (1 - 2)^2}$$

$$d = \sqrt{8^2 + (-1)^2}$$



$(3, 1)$ $(-5, 2)$
 x_1 y_1 x_2 y_2

$d(P_1, P_2) = \underline{\underline{d = \sqrt{65}}}$

(Simplify your answer. Type an exact answer, using radicals as needed.)

Answer: $\sqrt{65}$

$d = \sqrt{65}$ OR
 $d = 8.062257748$ OR Round
 $d = 8.06$

ID: F.1.21

3. Find the midpoint of the line segment joining the points P_1 and P_2 .

$P_1 = (3, -4); P_2 = (5, 6)$

Formula

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$(3, -4)$ $(5, 6)$
 x_1 y_1 x_2 y_2

The midpoint of the line segment joining the points P_1 and P_2 is _____.

(Simplify your answer. Type an ordered pair.)

Answer: $(4, 1)$

$\text{Midpoint} = \left(\frac{3+5}{2}, \frac{-4+6}{2} \right)$

$\text{Midpoint} = \left(\frac{3+5}{2}, \frac{-4+6}{2} \right)$

$\text{Midpoint} = \left(\frac{8}{2}, \frac{2}{2} \right)$

ID: F.1.39

$\text{Midpoint} = (4, 1)$

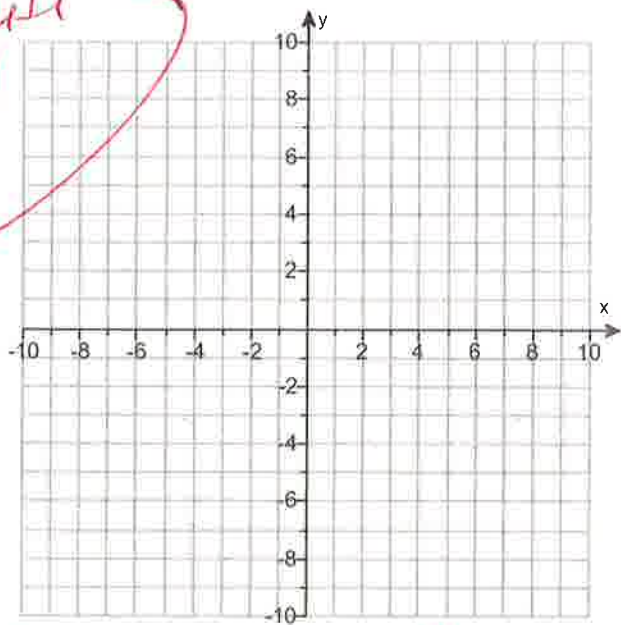


4.

For the equation $x^2 + y^2 - 2x - 4y - 11 = 0$, do the following.

- (a) Find the center (h,k) and radius r of the circle.
- (b) Graph the circle.
- (c) Find the intercepts, if any.

complete the square



(a) The center is _____.
(Type an ordered pair.)

The radius is r = _____.

(b) Use the graphing tool to graph the circle.

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

- A. The intercept(s) is/are _____.
(Type an ordered pair. Use a comma to separate answers as needed. Type exact answers for each coordinate, using radicals as needed.)
- B. There is no intercept.

$x^2 + y^2 - 2x - 4y - 11 = 0$
 $x^2 - 2x + y^2 - 4y = 11$ rewrite

B. There is no intercept.

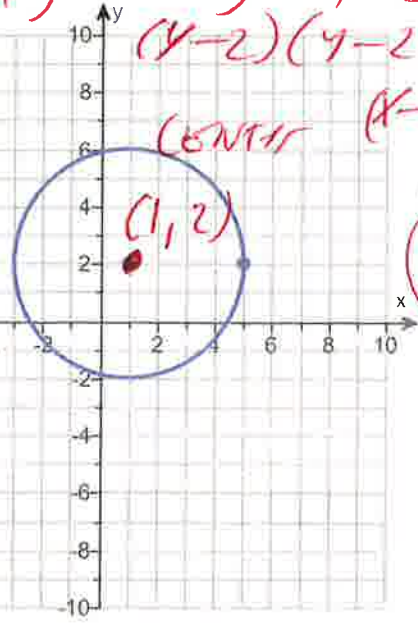
$x^2 - 2x + (\frac{1}{2}(-2))^2 + y^2 - 4y + (\frac{1}{2}(-4))^2 = 11 + (\frac{1}{2}(-2))^2 + (\frac{1}{2}(-4))^2$

Answers (1,2)

$x^2 - 2x + (-1)^2 + y^2 - 4y + (-2)^2 = 11 + (-1)^2 + (-2)^2$

$x^2 - 2x + 1 + y^2 - 4y + 4 = 11 + 1 + 4$

$(x-1)(x-1) + (y-2)(y-2) = 16$



$(x-1)^2 + (y-2)^2 = 16$

Center = (1, 2) ✓✓✓

Radius = $\sqrt{16} = 4$

A. The intercept(s) is/are $(1 - 2\sqrt{3}, 0), (1 + 2\sqrt{3}, 0), (0, 2 - \sqrt{15}), (0, 2 + \sqrt{15})$.

(Type an ordered pair. Use a comma to separate answers as needed. Type exact answers for each coordinate, using radicals as needed.)

ID: F.4.27

5. Find the domain of the function.

$$f(x) = \sqrt{2x-6}$$

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

Answer: $[3, \infty)$

$$f(x) = \sqrt{2x-6}$$

ID: 1.1.59

$$\begin{aligned} \text{Let } 2x - 6 &\geq 0 \\ 2x - 6 + 6 &\geq 0 + 6 \end{aligned}$$

$$2x \geq 6$$

$$\frac{2x}{2} \geq \frac{6}{2}$$

$$x \geq 3$$



$$[3, \infty)$$

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

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

$f(x) = 5x + 2; g(x) = 7x - 4$

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

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

$(5x+2) + (7x-4) =$

$5x+2+7x-4 =$

$12x-2 =$ ✓

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.)

$(5x+2) - (7x-4) =$

$5x+2-7x+4 =$

$-2x+6 =$ ✓

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.)

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

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

$(5x+2)(7x-4) =$

$35x^2 - 20x + 14x - 8 =$

$35x^2 - 6x - 8 =$ ✓

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.)

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

$\frac{f(x)}{g(x)}$

$\frac{5x+2}{7x-4}$ ✓

at $7x-4=0$
 $7x-4+4=0+4$
 $7x=4$
 $\frac{7x}{7} = \frac{4}{7}$

Domain $x \neq \frac{4}{7}$ ✓

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 $\}$.

$(f + g)(x) = 12x - 2$

$(f + g)(3) = 12(3) - 2$

$(f + g)(3) = 36 - 2$

$(f + g)(3) = 34$ ✓

(e) Find $(f+g)(3)$.

$(f+g)(3) =$ _____ (Type an integer or a simplified fraction.)

$(f-g)(x) = -2x+6$
 $(f-g)(4) = -2(4)+6$

(f) Find $(f-g)(4)$.

$(f-g)(4) =$ _____ (Type an integer or a simplified fraction.)

$(f-g)(4) = -8+6$
 $(f-g)(4) = -2$ ✓✓

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

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

$(f \cdot g)(x) = 35x^2 - 6x - 8$
 $(f \cdot g)(2) = 35(2)^2 - 6(2) - 8$

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

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

$(f \cdot g)(2) = 35(2)(2) - 6(2) - 8$
 $(f \cdot g)(2) = 35(4) - 6(2) - 8$
 $(f \cdot g)(2) = 140 - 12 - 8$
 $(f \cdot g)(2) = 128 - 8$
 $(f \cdot g)(2) = 120$ ✓✓

Answers $12x - 2$

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

$-2x + 6$

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

$35x^2 - 6x - 8$

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

$\frac{5x+2}{7x-4}$

A. The domain is $\left\{x \mid x \neq \frac{4}{7}\right\}$.

$\left(\frac{f}{g}\right)(x) = \frac{5x+2}{7x-4}$
 $\left(\frac{f}{g}\right)(1) = \frac{5(1)+2}{7(1)-4}$
 $\left(\frac{f}{g}\right)(1) = \frac{5+2}{7-4}$
 $\left(\frac{f}{g}\right)(1) = \frac{7}{3}$ ✓✓✓

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

34

-2

120

$\frac{7}{3}$

ID: 1.1.67

7. 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.

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

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

Answer: $2x + h - 2$

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

ID: 1.1.83

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

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

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

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

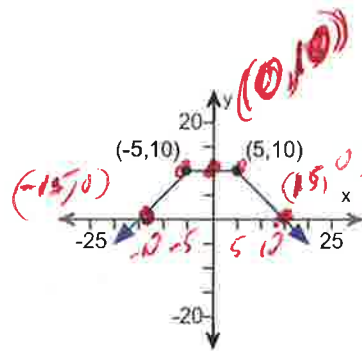
$$\frac{x^2 + 2xh + h^2 - 2x - 2h + 5 - x^2 - 2x - 5}{h} =$$

$$\frac{2xh + h^2 - 2h}{h} =$$

$$\frac{2xh}{h} + \frac{h^2}{h} - \frac{2h}{h} =$$

$$2x + h - 2$$

8. Determine whether the graph is that of a function by using the vertical-line test. If it is, use the graph to find
- its domain and range.
 - the intercepts, if any.
 - any symmetry with respect to the x-axis, y-axis, or the origin.



Is the graph that of a function?

- Yes
 No

If the graph is that of a function, what are the domain and range of the function? Select the correct choice below and fill in any answer boxes within your choice.

- A. The domain is $(-\infty, \infty)$. The range is $(-\infty, 10]$
 (Type your answers in interval notation.)

- B. The graph is not a function.

What are the intercepts? Select the correct choice below and fill in any answer boxes within your choice.

- A. $(-15, 0)$ $(15, 0)$ $(0, 10)$
 (Type an ordered pair. Use a comma to separate answers as needed.)

- B. There are no intercepts.

- C. The graph is not a function.

Determine if the graph is symmetrical.

- A. It is symmetrical with respect to the x-axis.

- B. It is symmetrical with respect to the y-axis.

- C. It is symmetrical with respect to the origin.

- D. The graph is not symmetrical.

- E. The graph is not a function.

Answers Yes

A. The domain is $(-\infty, \infty)$. The range is $(-\infty, 10]$
 (Type your answers in interval notation.)

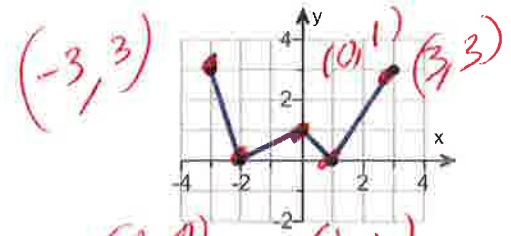
A. $(15, 0), (-15, 0), (0, 10)$ (Type an ordered pair. Use a comma to separate answers as needed.)

B. It is symmetrical with respect to the y-axis.

ID: 1.2.21

9. 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?

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

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

(b) The domain is $[-3, 3]$ *[left, right]*
 (Type your answer in interval notation.)

The range is $[0, 3]$ *[bottom, top]*
 (Type your answer in interval notation.)

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

example
 favorite place for a
 double meat
 double cheese
 double bacon
 hamburger at
 236 am
 Add a diet
 Soda

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

$[-3,3]$

$[0,3]$

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.

ID: 1.3.25

10. The function f is defined as follows.

$$f(x) = \begin{cases} 3 + x & \text{if } x < 0 \\ x^2 & \text{if } x \geq 0 \end{cases}$$

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

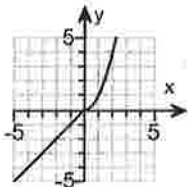
(a) The domain of the function f is $(-\infty, \infty)$ ← (left, right)
 (Type your answer in interval notation.)

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

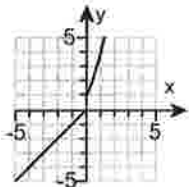
- A. The intercept(s) is/are $(-3, 0)$, $(0, 0)$ ← x -intercept, y -intercept
 (Type an ordered pair. Use a comma to separate answers as needed.)
- B. There are no intercepts.

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

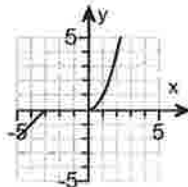
A.



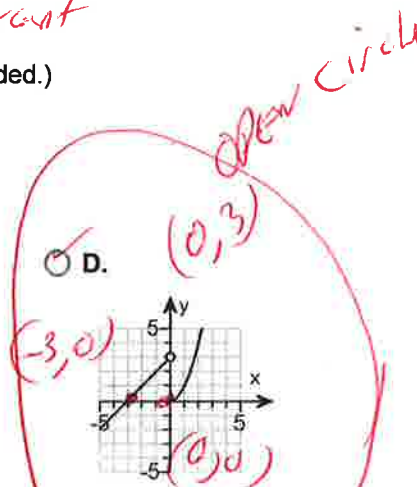
B.



C.



D.

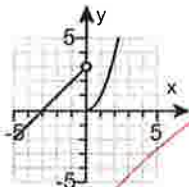


(d) The range of the function f is $(-\infty, \infty)$ ← (bottom, TOP)
 (Type your answer in interval notation.)

Answers $(-\infty, \infty)$

- A. The intercept(s) is/are $(-3, 0), (0, 0)$.
 (Type an ordered pair. Use a comma to separate answers as needed.)

D.
 $(-\infty, \infty)$



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

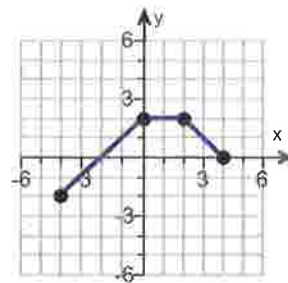
use graphing calculator

2ND MATH

ID: 1.4.37

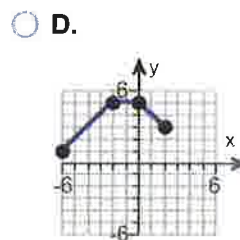
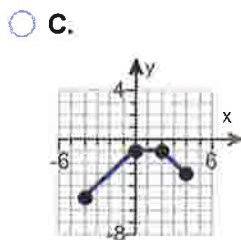
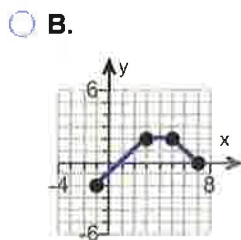
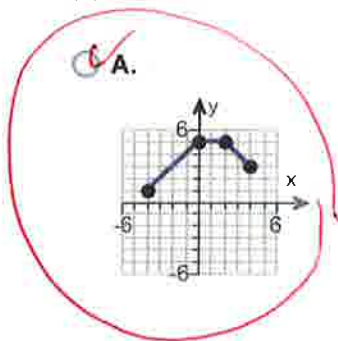
$y_1 = 3 + x \div (x < 0)$ *Open Circle*
 $y_2 = x^2 \div (x \geq 0)$ *Close Circle*

11. 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.

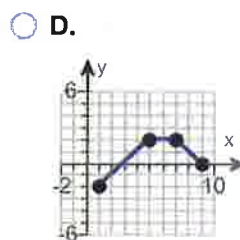
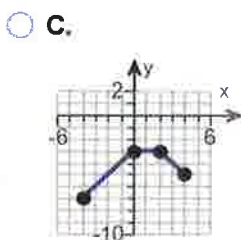
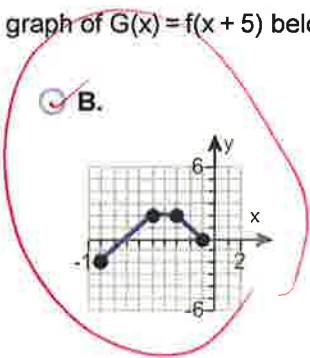
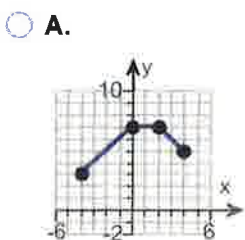


- (a) $F(x) = f(x) + 3$
- (b) $G(x) = f(x + 5)$
- (c) $P(x) = -f(x)$
- (d) $H(x) = f(x + 2) - 1$
- (e) $Q(x) = \frac{1}{2}f(x)$
- (f) $g(x) = f(-x)$
- (g) $h(x) = f(2x)$

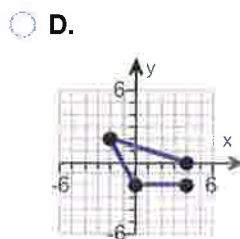
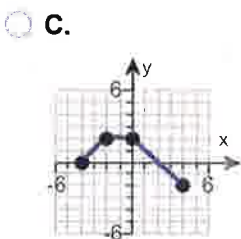
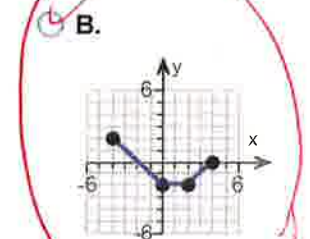
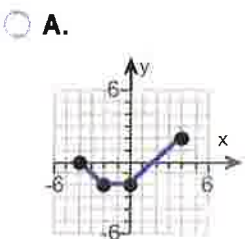
(a) Choose the correct graph of $F(x) = f(x) + 3$ below.



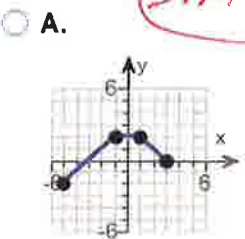
(b) Choose the correct graph of $G(x) = f(x + 5)$ below.



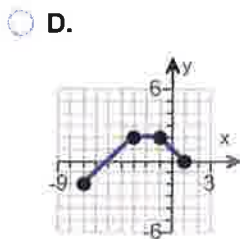
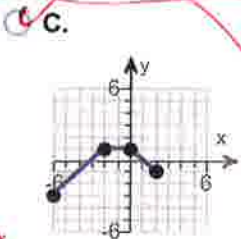
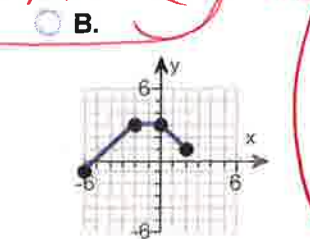
(c) Choose the correct graph of $P(x) = -f(x)$ below.



(d) Choose the correct graph of $H(x) = f(x + 2) - 1$ below.

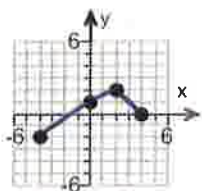


Shift left -2 → *Shift down -1*

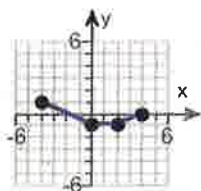


(e) Choose the correct graph of $Q(x) = \frac{1}{2}f(x)$ below.

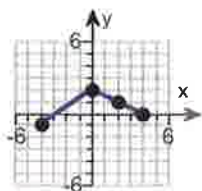
A.



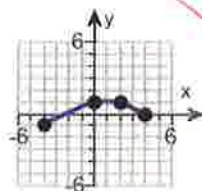
B.



C.

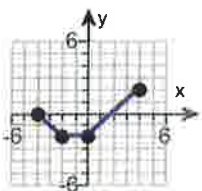


D.

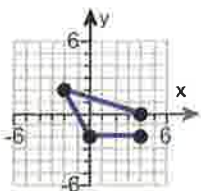


(f) Choose the correct graph of $g(x) = f(-x)$ below.

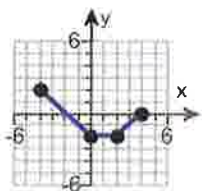
A.



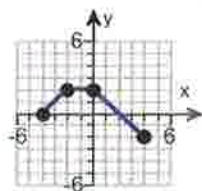
B.



C.

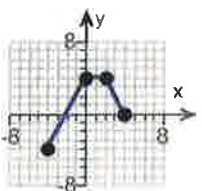


D.

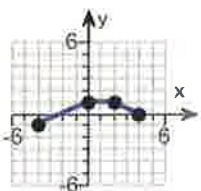


(g) Choose the correct graph of $h(x) = f(2x)$ below.

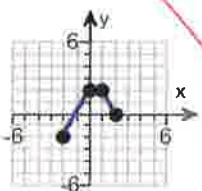
A.



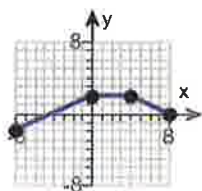
B.



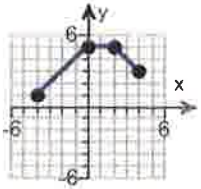
C.



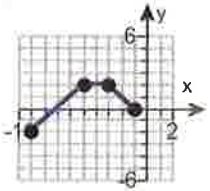
D.



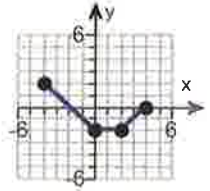
Answers



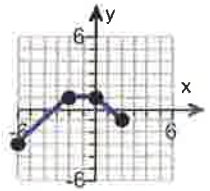
A.



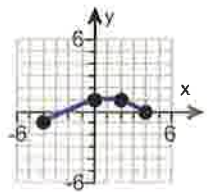
B.



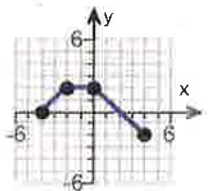
B.



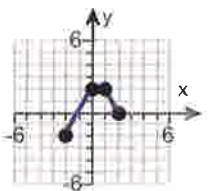
C.



D.



D.



C.

ID: 1.5.63

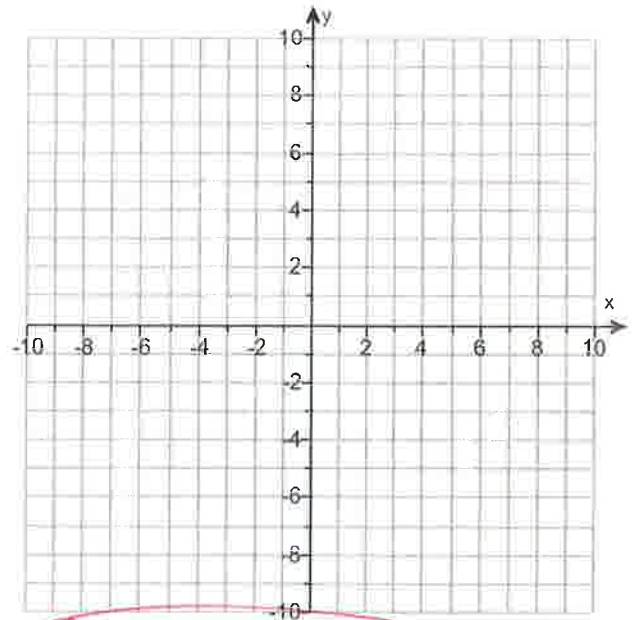
12.

- (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.

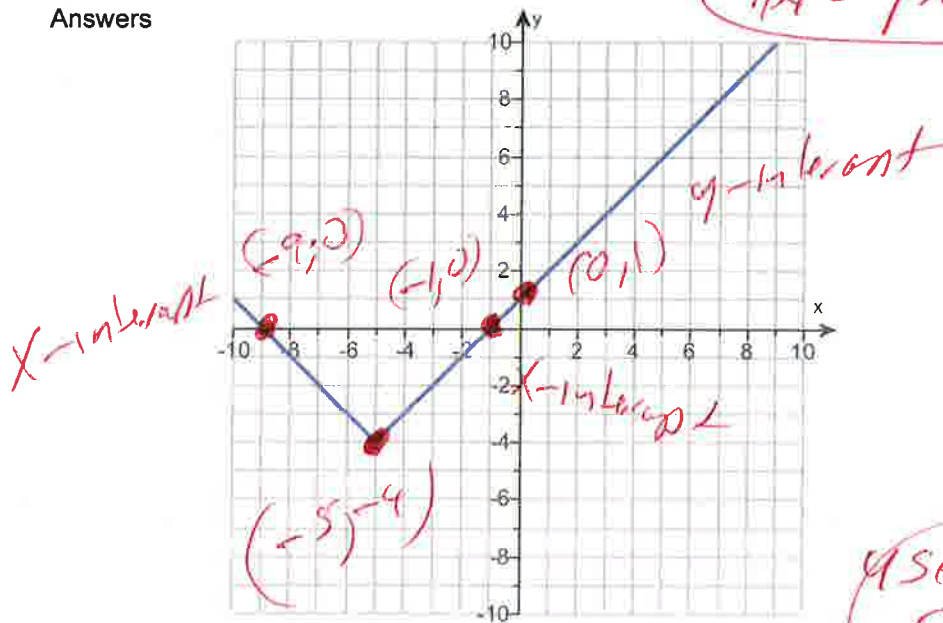
(a) Graph $f(x)$.

(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
 $x_{\min} = -12$
 $x_{\max} = 12$
 $y_{\min} = -10$
 $y_{\max} = 10$

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

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

13. Find the zeros, if any, of the quadratic function using the quadratic formula. What are the x-intercepts, if any, of the graph of the function?

$$f(x) = 8x^2 + 11 + 20x$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice. (Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

- A. The zeros and the x-intercepts are different. The zeros are _____, the x-intercepts are _____.
- B. The zeros and the x-intercepts are the same. They are _____.
- C. There is no real zero solution and no x-intercept.

Answer: B. The zeros and the x-intercepts are the same. They are $\frac{-5 + \sqrt{3}}{4}, \frac{-5 - \sqrt{3}}{4}$.

ID: 2.3.47

$$f(x) = 8x^2 + 11 + 20x$$

$$f(x) = 8x^2 + 20x + 11$$

$$a=8, b=20, c=11$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \text{formula}$$

$$x = \frac{-(20) \pm \sqrt{(20)^2 - 4(8)(11)}}{2(8)}$$

$$x = \frac{-20 \pm \sqrt{400 - 352}}{16}$$

$$x = \frac{-20 \pm \sqrt{48}}{16}$$

$$x = \frac{-20 \pm \sqrt{48}}{16}$$

$$x = \frac{-20 \pm \sqrt{16 \cdot 3}}{16}$$

$$x = \frac{-20 \pm \sqrt{16} \sqrt{3}}{16}$$

$$x = \frac{-20 \pm 4\sqrt{3}}{16}$$

$$x = \frac{-5 \pm \sqrt{3}}{4}$$

$$x = \frac{-5 \pm \sqrt{3}}{4}$$

$$x = \frac{-5 \pm \sqrt{3}}{4}$$

$$x = \frac{-5 + \sqrt{3}}{4}$$

OR

$$x = \frac{-5 - \sqrt{3}}{4}$$

Primes 2, 3, 5, 7, 11, 13, ...

$2 \overline{) 48}$
 $2 \overline{) 24}$
 $2 \overline{) 12}$
 $2 \overline{) 6}$
 $3 \overline{) 3}$
 1

$48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$
 $48 = 16 \cdot 3$

14

For the quadratic function $f(x) = x^2 - 8x$, 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?

- up
 down

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.

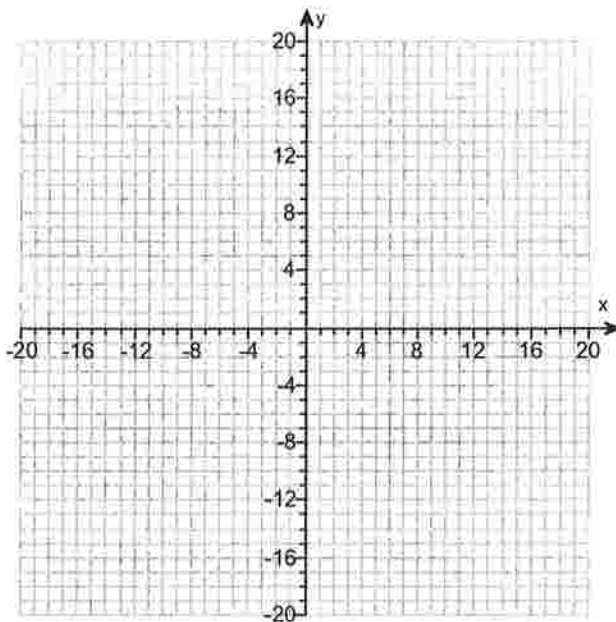
Use the graphing tool to graph the function.

(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.



Answers up

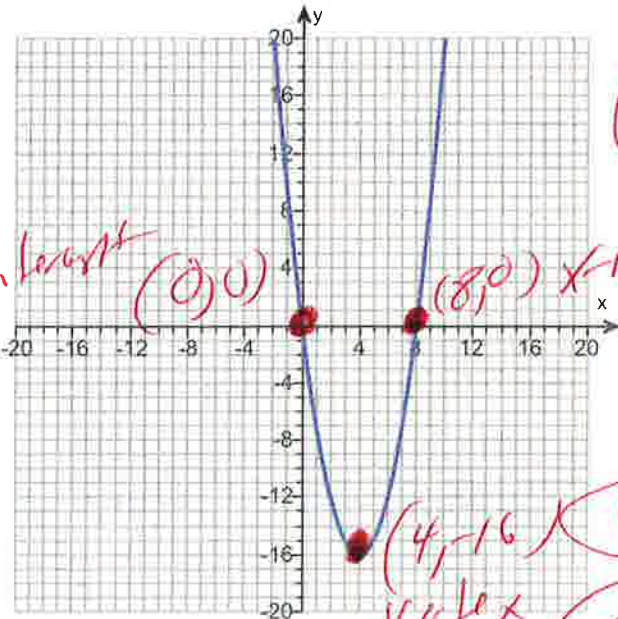
(4, -16)

x = 4

A. The x-intercept(s) is/are 0, 8

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

A. The y-intercept is 0. (Type an integer or a decimal.)



Both x-intercepts also y-intercept

Example
Swimming in the ocean at 237am on Saturday night by yourself

Shark LAW
Sharks EAT only in the day time

x	f(x)
0	0
4	-16
8	0

you are the vertex

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

use graphing calculator

$(-\infty, \infty)$

$[-16, \infty)$

$[4, \infty)$

$(-\infty, 4]$

Window

$$x\text{-min} = -12$$

$$x\text{-max} = 12$$

$$y\text{-min} = -20$$

$$y\text{-max} = 20$$

ID: 2.4.33

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

BIG

~~15.~~
NEXT
Please

15

For the quadratic function $f(x) = x^2 - 4x - 12$, 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.

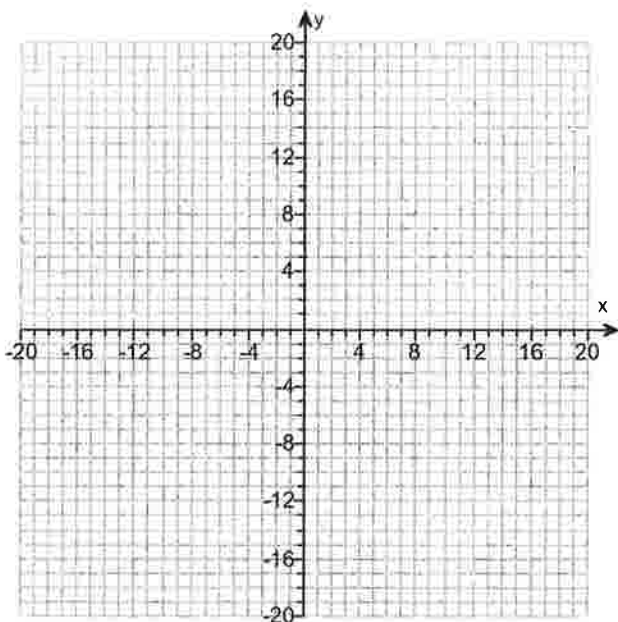
Use the graphing tool to graph the function.

(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.



Answers up

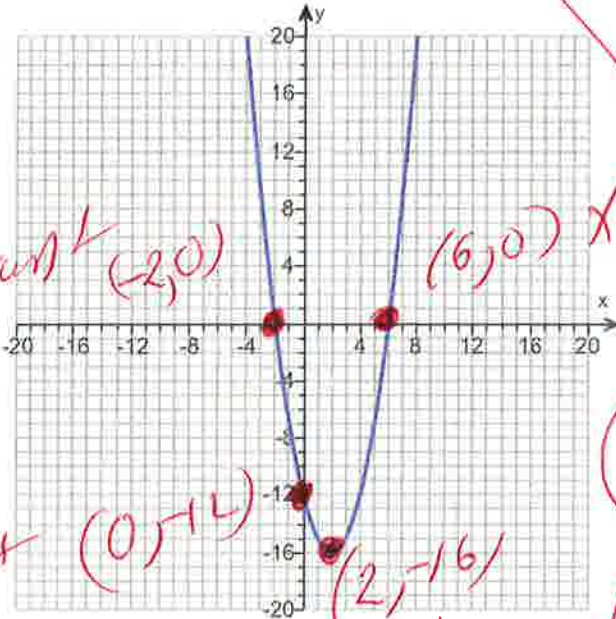
(2, -16)

x = 2

A. The x-intercept(s) is/are 6, -2.
(Type an integer or a decimal. Use a comma to separate answers as needed.)

A. The y-intercept is -12. (Type an integer or a decimal.)

Example
Swimming in the sea at 2:33am
by yourself on Saturday night
after eating a double meat,
double cheese
double bacon
hamburger with
a diet tea



$f(x) = x^2 - 4x - 12$

Sharks eat
in day and
always sleep
at night.

x	f(x)
-2	0
0	-12
2	-16
6	0

$(-\infty, \infty)$

$[-16, \infty)$

$[2, \infty)$

$(-\infty, 2]$

Window
x-min = -12
x-max = 12

y-min = -20
y-max = 20

Vertex

use
graphing calculator

ID: 2.4.37

$y_1 = x^2 - 4x - 12$
BIT BIT

~~16~~
Next Page
Please

16

For the quadratic function $f(x) = -2x^2 + 2x - 2$, answer parts (a) through (c). Verify the results using a graphing utility.

(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.

The graph of f opens (1) _____

The vertex of f is _____
(Type an ordered pair.)

The axis of symmetry is _____
(Type an equation. Simplify your answer.)

Determine 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.

Determine 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 rounded to two decimal places as needed. Use a comma to separate answers as needed.)
- B. There is no x-intercept.

Use the graphing tool to graph the function.

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

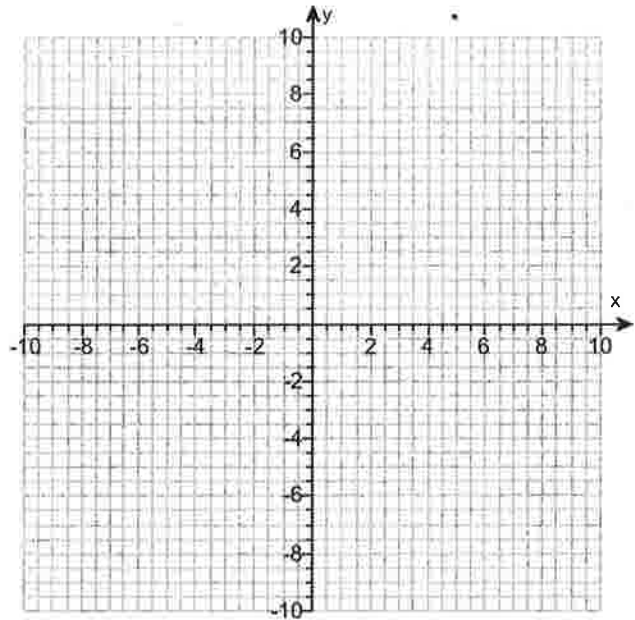
The domain of f is _____
(Type your answer in interval notation.)

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 _____
(Type your answer in interval notation.)

The function is decreasing on the interval _____



- (1) down.
 up.

Answers (1) down.

$$\left(\frac{1}{2}, -\frac{3}{2}\right)$$

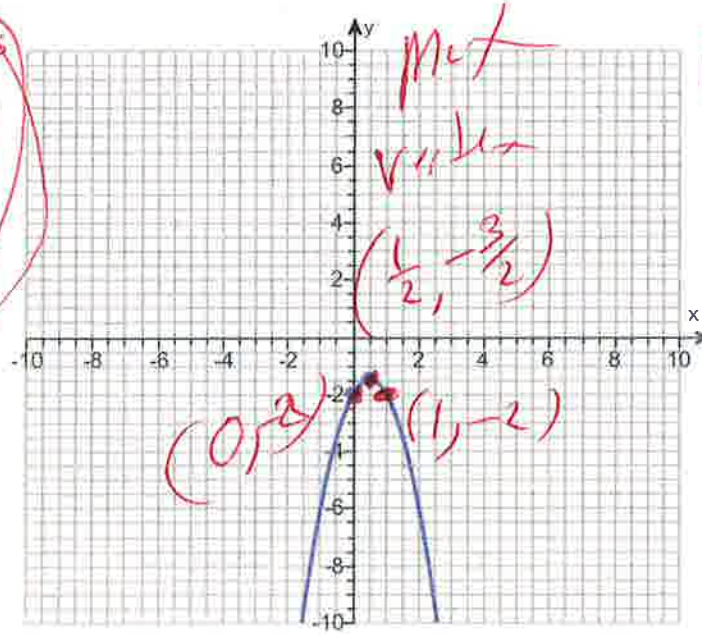
$$x = \frac{1}{2}$$

A. The y-intercept is -2. (Type an integer or a decimal.)

B. There is no x-intercept.

Example
 Swims in the ocean for 2 hours
 only because you could get
 Leg and arm cramps.
 Swim at 238 am always

*Sharks
 sleep
 at
 night!*



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

x	f(x)
0	-2
$\frac{1}{2}$	$-\frac{3}{2}$
1	-2

vertex

- $(-\infty, \infty)$
- $\left[-\infty, -\frac{3}{2}\right]$
- $\left[-\infty, \frac{1}{2}\right]$
- $\left[\frac{1}{2}, \infty\right)$

Window
 $x_{-min} = -12$
 $x_{+max} = 12$
 $y_{-min} = -10$
 $y_{+max} = 10$

*Use graphing
 calculator*

ID: 2.4.43

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

BTG

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

$$R(x) = \frac{5x}{x+12}$$

$$RA = \frac{5x}{x+12} \quad \text{set } x+12=0$$

$$x+12-12=0-12$$

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.

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.

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.

Answers A. The vertical asymptote(s) is/are $x =$ -12
(Use a comma to separate answers as needed.)

A. The horizontal asymptote(s) is/are $y =$ 5
(Use a comma to separate answers as needed.)

B. There is no oblique asymptote.

ID: 3.4.45

Horizontal asymptote $y = 5$

Since the highest power on top is the same as the highest power on the bottom then there is no oblique asymptote.

18. For $f(x) = 8x + 5$ 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 $64x + 5$ B. The domain of $f \circ g$ is all real numbers.

$64x + 40$

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

$64x + 45$

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

(18) a $f(x) = 8x + 5$ and $g(x) = 8x$ *in side here*

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

$f(g(x)) =$

$f(8x) =$

$8(8x) + 5 =$
 $64x + 5 =$

domain
 $(-\infty, \infty)$

(18) b $f(x) = 8x + 5$ and $g(x) = 8x$ *in side here*

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

$g(f(x)) =$

$g(8x + 5) =$

$8(8x + 5) =$

$64x + 40 =$

domain
 $(-\infty, \infty)$

19
~~19~~
 NEXT Please

(18) $f(x) = 8x + 5$ and $g(x) = 8x$
 ↑ inside itself

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

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

$$f(8x + 5) =$$

$$8(8x + 5) + 5 =$$

$$64x + 40 + 5 =$$

$$64x + 45 =$$

Domain

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

(8) $f(x) = 8x + 5$ and $g(x) = 8x$
 ↑ inside itself

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

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

$$g(8x) =$$

$$8(8x) =$$

$$64x =$$

Domain

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

19

The function $f(x) = 6x + 3$ 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 $\{x|x \geq \text{_____}\}$.
- B. The domain is $\{x|x \neq \text{_____}\}$.
- C. The domain is $\{x|x \leq \text{_____}\}$.
- 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.

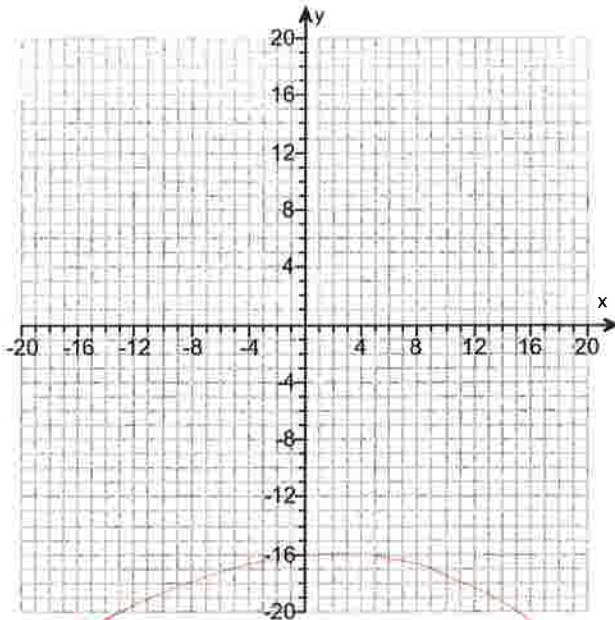
- A. The range is $\{y|y \geq \text{_____}\}$.
- B. The range is $\{y|y \neq \text{_____}\}$.
- C. The range is $\{y|y \leq \text{_____}\}$.
- D. The range is the set of all real numbers.

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



Handwritten work in red ink:

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

$$y = 6x + 3 \quad \text{Set } y =$$

$$x = 6y + 3 \quad \text{INV var } x-y$$

$$x - 3 = 6y + 3 - 3 \quad \text{Sub for } y$$

$$x - 3 = 6y$$

$$\frac{x-3}{6} = \frac{6y}{6}$$

$$\frac{x-3}{6} = y$$

Write

$$y = \frac{x-3}{6}$$

Inverse

$$f^{-1}(x) = \frac{x-3}{6}$$

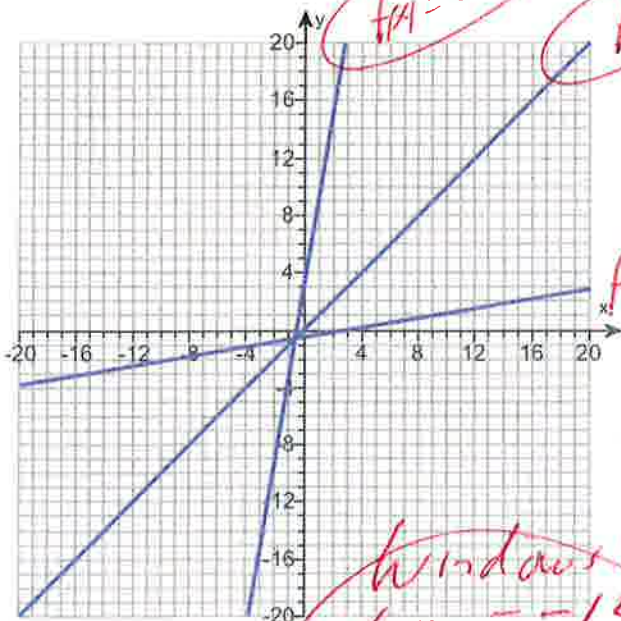
Answers $\frac{x-3}{6}$

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.



$y_1 = 6x + 3$

$y_2 = x$

$f^{-1}(x) = (x-3) \div (6)$

$y_3 = (x-3) \div (6)$

use graphing calculator

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

ID: 4.2.53

20. Solve the equation.

$64^{-x+26} = 128^x$

$(2^6)^{-x+26} = (2^7)^x$

The solution set is { }.

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

Answer: 12

$2^{-6x+156} = 2^{7x}$ ← mult both

$-6x + 156 = 7x$

ID: 4.3.73

$-6x + 156 - 156 = 7x - 156$

$-6x = 7x - 156$

$-6x - 7x = 7x - 156 - 7x$

$-13x = -156$

$\frac{-13x}{-13} = \frac{-156}{-13}$

$x = 12$

Primes 2, 3, 5, 7, 11, 13, ...

$2 \overline{)64}$	$2 \overline{)128}$
$2 \overline{)32}$	$2 \overline{)64}$
$2 \overline{)16}$	$2 \overline{)32}$
$2 \overline{)8}$	$2 \overline{)16}$
$2 \overline{)4}$	$2 \overline{)8}$
$2 \overline{)2}$	$2 \overline{)4}$
1	$2 \overline{)2}$
	1

$64 = 2^6$

$128 = 2^7$

21. If a single pane of glass obliterates 1% of the light passing through it, the percent p of light that passes through n successive panes is given approximately by the function below.

$$p(n) = 100(0.99)^n$$

- (a) What percent of light will pass through 5 panes?
 (b) What percent of light will pass through 20 panes?
 (c) Explain the meaning of the base 0.99 in this problem.

$$P(t) = 100(0.99)^t$$

formula

(a) The percent of light that will pass through 5 panes is approximately _____ %.
 (Round to the nearest whole number as needed.)

(a) The percent of light that will pass through 20 panes is approximately _____ %.
 (Round to the nearest whole number as needed.)

(c) Choose the correct answer below.

- A. Each pane allows only 0.01% of light to pass through.
 B. Each pane allows only 0.99% of light to pass through.
 C. Each pane allows only 99% of light to pass through.
 D. Each pane allows only 1% of light to pass through.

Use
graphing
calculator

Answers 95

82

C. Each pane allows only 99% of light to pass through.

ID: 4.3.105

$$21 \text{ (a)} \quad p(5) = 100(0.99)^5$$

$$p(5) = 100(0.99)^5$$

$$p(5) = 95.09900995$$

$$p(5) = 95 \text{ Round}$$

$$21 \text{ (b)} \quad p(20) = 100(0.99)^{20}$$

$$p(20) = 100(0.99)^{20}$$

$$p(20) = 81.79069376$$

$$p(20) = 82 \text{ Round}$$

22. The percentage of patients P who have survived t years after initial diagnosis of a certain disease is modeled by the function $P(t) = 100(0.5)^t$.

(a) According to the model, what percent of patients survive 1 year after initial diagnosis?

(b) What percent of patients survive 3 years after initial diagnosis?

(c) Explain the meaning of the base 0.5 in the context of this problem.

(a) According to the model, 50 % of patients survive 1 year after initial diagnosis.
(Type an integer or a decimal.)

(b) According to the model, 12.5 % of patients survive 3 years after initial diagnosis.
(Type an integer or a decimal.)

(c) Explain the meaning of the base 0.5 in the context of this problem. Select the correct choice below and fill in the answer box to complete your choice.

- A. As each year passes, _____ % of the total patients have survived.
- B. As each year passes, _____ % of the previous year's survivors have survived.
- C. As each year passes, _____ % of the previous survivors take the diagnosis.

Answers 50

12.5

B. As each year passes, 50 % of the previous year's survivors have survived.

use graphing calculator

ID: 4.3.109

23. The function

$D(h) = 5e^{-0.11h}$

$D(h) = 5e^{-0.11h}$

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 has been administered. How many milligrams will be present after 1 hour? After 5 hours?

After 1 hour, there will be _____ milligrams. (Round to two decimal places as needed.)

After 5 hours, there will be _____ milligrams. (Round to two decimal places as needed.)

Answers 4.48

2.88

$D(1) = 5e^{(-0.11(1))}$

$D(1) = 4.479170676$

$D(1) = 4.48$ Round

use graphing calculator

ID: 4.3.111

$D(5) = 5e^{(-0.11(5))}$


$D(5) = 2.884749052$

$D(5) = 2.88$ Round

24. Determine the domain of $f(x) = \log_5(x + 4)$.

Choose the correct answer below.

- (0, ∞)
- (4, ∞)
- (-∞, ∞)
- (-4, ∞)

let $x+4 > 0$
 $x+4-4 > 0-4$
 $x > -4$ ✓

 $(-4, \infty)$ ✓

Formula domain
 $f(x) = \log_5(Ax+B)$
 let $Ax+B > 0$

Answer: (-4, ∞)

ID: 4.4.10

25. Solve the equation.

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

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 $4x + 5 = 2^4$

$\frac{11}{4}$

Formally
 work on
 work off

$\log_2(4x+5) = 4$
 Rewrite
 $2^4 = 4x+5$
 $2 \cdot 2 \cdot 2 \cdot 2 = 4x+5$
 $16 = 4x+5$
 $16-5 = 4x+5-5$ ✓✓✓
 $11 = 4x$
 $\frac{11}{4} = \frac{4x}{4}$
 $\frac{11}{4} = x$ ✓✓✓

ID: 4.4.91-Setup & Solve

26. The formula

$D = 20e^{-0.6h}$

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: 3.16

ID: 4.4.125

Use graphing calculator ✓✓✓

$3 = 20e^{-0.6h}$
 $\frac{3}{20} = \frac{20e^{-0.6h}}{20}$
 $0.15 = e^{-0.6h}$
 $\ln(0.15) = \ln e^{-0.6h}$
 $\ln(0.15) = -0.6h \ln(e)$
 $\ln(0.15) = -0.6h(1)$
 $\ln(0.15) = -0.6h$
 $\frac{\ln(0.15)}{-0.6} = \frac{-0.6h}{-0.6}$
 $3.161866641 = h$
 $3.16 = h$ ✓✓✓

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

$$\log \left[\frac{x(x+7)}{(x+5)^{15}} \right], x > 0$$

Formula $\log\left(\frac{A}{B}\right) = \log(A) - \log(B)$
 $\log(AB) = \log(A) + \log(B)$
 $\log(A^N) = N \log(A)$

$$\log \frac{x(x+7)}{(x+5)^{15}} = \log(x(x+7)) - 15 \log(x+5)$$

$$\log \left[\frac{x(x+7)}{(x+5)^{15}} \right] =$$

$$\log x(x+7) - \log(x+5)^{15} =$$

(Simplify your answer.)

$$\log x + \log(x+7) - 15 \log(x+5) =$$

Answer: $\log x + \log(x+7) - 15 \log(x+5)$

$$\log(x) + \log(x+7) - 15 \log(x+5) =$$

ID: 4.5.51

28. Solve the logarithmic equation.

$$\log x + \log(x - 48) = 2$$

$$\log_{10}(x)(x-48) = 2$$

Formula

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

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

$$\log(A^N) = N \log(A)$$

Determine the equation to be solved after removing the logarithm.

$$10^2 = x(x-48)$$

$$100 = x^2 - 48x$$

(Type an equation. Do not simplify.)

$$0 = x^2 - 48x - 100$$

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.)

$$0 = (x+2)(x-50)$$

B. There is no solution.

$$x+2=0 \quad \text{OR} \quad x-50=0$$

$$x+2-2=0-2 \quad \text{OR} \quad x-50+50=0+50$$

Answers $x(x-48) = 10^2$

$$\cancel{x=-2} \quad \text{OR} \quad x=50 \quad \text{Check}$$

A. The solution set is { 50 }.

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

$$\log(x) + \log(x-48) = 2$$

Try $x=-2$

ID: 4.6.17-Setup & Solve

$$\log(-2) + \log(-2-48) = 2$$

$$\log(-2) + \log(-50) = 2$$

BAD BAD

$$\log(x) + \log(x-48) = 2$$

$$\log(50) + \log(50-48) = 2$$

$$\log(50) + \log(2) = 2$$

GOOD GOOD

ANSWER

$$x=50$$

only

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

$$3^{x-3} = 81$$

$$3^{x-3} = 3^4 \text{ rewrite}$$

$$\ln(3^{x-3}) = \ln(81)$$

$$(x-3) \ln(3) = \ln(81)$$

$$\frac{(x-3) \ln(3)}{\ln(3)} = \frac{\ln(81)}{\ln(3)}$$

$$x-3 = \frac{\ln(81)}{\ln(3)}$$

$$x-3+3 = \frac{\ln(81)}{\ln(3)} + 3$$

$$x = \frac{\ln(81)}{\ln(3)} + 3$$

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 $\{ \quad \}$.
(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 $\{ \quad \}$.
(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 $\{ 7 \}$. (Simplify your answer. Type an exact answer.)

A. The solution set is $\{ 7.000 \}$.
(Simplify your answer. Type an integer or decimal rounded to three decimal places as needed.)

ID: 4.6.41

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

\$700 invested at 11% compounded quarterly after a period of 4 years

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

Answer: 1080.46

ID: 4.7.7

Formula

$$P = 700$$

$$r = 11\% = 0.11$$

$$n = 4 = \text{Quarterly}$$

$$t = 4 = \text{years}$$

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

$$A = 700 \left(1 + \frac{0.11}{4}\right)^{(4)(4)}$$

$$A = 700 (1 + 0.11)^{16}$$

$$A = \$1080.456605$$

$$A = 1080.46 \text{ Round}$$

31. How many years will it take for an initial investment of \$30,000 to grow to \$45,000? Assume a rate of interest of 13% compounded continuously.

It will take about _____ years for the investment to grow to \$45,000.
(Round to two decimal places as needed.)

Answer: 3.12

ID: 4.7.41

Formula

$$A = Pe^{rt}$$

$$\ln(1.5) = 0.13t(1)$$

$$\ln(1.5) = 0.13t$$

$$\frac{\ln(1.5)}{0.13} = \frac{0.13t}{0.13}$$

$$3.11896237 = t$$

$$3.12 = t \text{ Round}$$

$$\ln(1.5) = \ln(e^{0.13t})$$

$$\ln(1.5) = 0.13t \ln(e)$$

32. The population of a colony of mosquitoes obeys the law of uninhibited growth. Use this information to answer parts (a) through (c). *OR Lice*

(a) If N is the population of the colony and t is the time in days, express N as a function of t . Consider N_0 is the original amount at $t = 0$ and $k \neq 0$ is a constant that represents the growth rate. *Lice*

$N(t) =$ _____ (Type an expression using t as the variable and in terms of e .)

(b) The population of a colony of mosquitoes obeys the law of uninhibited growth. If there are 1000 mosquitoes initially and there are 1300 after 1 day, what is the size of the colony after 2 days? *Lice*

Approximately _____ mosquitoes. *Lice*

(Do not round until the final answer. Then round to the nearest whole number as needed.)

(c) How long is it until there are 20,000 mosquitoes? *Lice*

About _____ days.

(Do not round until the final answer. Then round to the nearest tenth as needed.)

Answers $N_0 e^{kt}$

1690

11.4

ID: 4.8.5

31 a

$$N(t) = N_0 e^{kt}$$

32 b

$$N(t) = 1000 e^{k(t)}$$

$$1300 = 1000 e^k$$

$$1300 = 1000 e^k$$

$$\frac{1300}{1000} = \frac{1000 e^k}{1000}$$

$$1.3 = e^k$$

$$\ln(1.3) = \ln(e^k)$$

$$\ln(1.3) = k \ln(e)$$

$$\ln(1.3) = k(1)$$

$$\ln(1.3) = k$$

$$0.2623642645 = k$$

$$0.26236 = k \quad \text{Round}$$

$$N(t) = 1000 e^{0.26236t} \quad \text{2ND LN}$$

$$N(2) = 1000 e^{0.26236(2)}$$

$$N(2) = 1689.985586$$

$$N(2) = 1690 \quad \text{Round}$$

$$(30) \quad N(t) = 1000 e^{0.26236t}$$

$$20000 = 1000 e^{0.26236t}$$

$$\frac{20000}{1000} = \frac{1000 e^{0.26236t}}{1000}$$

$$20 = e^{0.26236t}$$

$$\ln(20) = \ln(e^{0.26236t})$$

$$\ln(20) = 0.26236t \ln(e)$$

$$\ln(20) = 0.26236t (1)$$

$$\frac{\ln(20)}{0.26236} = \frac{0.26236t}{0.26236}$$

$$11.41840324 = t$$

$$11.4 = t \quad \text{Round}$$

33. The half-life of carbon-14 is 5600 years. If a piece of charcoal made from the wood of a tree shows only 79% of the carbon-14 expected in living matter, when did the tree die?

The tree died about _____ years ago.

(Do not round until the final answer. Then round to the nearest whole number.)

Answer: 1904

ID: 4.8.11

$$A = P\left(\frac{1}{2}\right)^{\frac{t}{5600}}$$

$$79 = 100 \left(\frac{1}{2}\right)^{\frac{t}{5600}}$$

$$\frac{79}{100} = \frac{100 \left(\frac{1}{2}\right)^{\frac{t}{5600}}}{100}$$

$$\frac{5600 \ln(0.79)}{\ln\left(\frac{1}{2}\right)} = \frac{5600 \cdot t}{5600}$$

$$0.79 = \left(\frac{1}{2}\right)^{\frac{t}{5600}}$$

$$\ln(0.79) = \ln\left(\frac{1}{2}\right)^{\frac{t}{5600}}$$

$$\ln(0.79) = \frac{t}{5600} \ln\left(\frac{1}{2}\right)$$

$$\frac{\ln(0.79)}{\ln\left(\frac{1}{2}\right)} = \frac{t}{5600} \frac{\ln\left(\frac{1}{2}\right)}{\ln\left(\frac{1}{2}\right)}$$

$$\frac{\ln(0.79)}{\ln\left(\frac{1}{2}\right)} = \frac{t}{5600}$$

$$\frac{\ln(0.79)}{\ln\left(\frac{1}{2}\right)} = \frac{t}{5600}$$

$$1904.422473 = t$$

$$1904 = t$$

34. The logistic growth model $P(t) = \frac{1000}{1 + 31.33 e^{-0.429t}}$ represents the population (in grams) of a bacterium after t hours. Answer parts (a) through (f).

(a) Determine the carrying capacity of the environment.

The carrying capacity of the environment is 7000 g.

(b) What is the growth rate of the bacteria?

The growth rate is 42.9 % per hour.
(Type an integer or a decimal.)

(c) Determine the initial population size.

Initially, the population was _____ g.
(Round to the nearest whole number as needed.)

$P(0) = 1000 \div (1 + 31.33 e^{1(-0.429(0))})$

$P(0) = 30.93102382$

$P(0) = 31$ Round =

Initial Population Start

(d) What is the population after 9 hours?

After 9 hours, the population is _____ g.
(Do not round until the final answer. Then round to the nearest tenth as needed.)

$P(9) = 1000 \div (1 + 31.33 e^{1(-0.429(9))})$

$P(9) = 602.627203$

9 hours later

(e) When will the population be 700 g?

It will take approximately _____ hour(s) for the population to reach 700 g.
(Round the final answer to the nearest hundredth as needed. Round all intermediate values to the nearest ten-thousandth as needed.)

$P(9) = 602.6$ Round

(f) How long does it take for the population to reach one-half the carrying capacity?

The population will reach one-half of the carrying capacity in about _____ hour(s).
(Round the final answer to the nearest tenth as needed. Round all intermediate values to the nearest ten-thousandth as needed.)

- Answers 1000
- 42.9
- 31
- 602.6
- 10
- 8

Set $700 = \frac{1000}{1 + 31.33 e^{-0.429t}}$

(Cross mult)

$(700)(1 + 31.33 e^{-0.429t}) = 1(1000)$

$(700)(1 + 31.33 e^{-0.429t}) = \frac{1000}{700}$

$1 + 31.33 e^{-0.429t} = 1.428571429$

$31.33 e^{-0.429t} = 1.428571429 - 1$

$31.33 e^{-0.429t} = 0.428571429$

$\frac{31.33 e^{-0.429t}}{31.33} = \frac{0.428571429}{31.33}$

(34)

$$e^{-0.429t} = 0.0136792668$$

$$\ln e^{-0.429t} = \ln(0.0136792668)$$

$$(-0.429t) \ln(e) = \ln(0.0136792668)$$

$$(-0.429t)(1) = \ln(0.0136792668)$$

$$-0.429t = \ln(0.0136792668)$$

$$-0.429t = \frac{\ln(0.0136792668)}{-0.429}$$

$$-0.429$$

$$-0.429$$

$$t = 10.00436822$$

$$t = 10$$

hours
set

Round

(34)

$$f \frac{500}{t} = \frac{1000}{1 + 31.33 e^{-0.429t}}$$

$$500(1 + 31.33 e^{-0.429t}) = 1(1000) \text{ (Cross Mult)}$$

$$\frac{500(1 + 31.33 e^{-0.429t})}{500} = \frac{1000}{500}$$

$$1 + 31.33 e^{-0.429t} = 2$$

34 f

$$1 + 31.33 e^{-0.429t} - 1 = 2 - 1$$

$$31.33 e^{-0.429t} = 1$$

$$\frac{31.33 e^{-0.429t}}{31.33} = \frac{1}{31.33}$$

$$e^{-0.429t} = .0319182892$$

$$\ln(e^{-0.429t}) = \ln(.0319182892)$$

$$-0.429t \ln(e) = \ln(.0319182892)$$

$$-0.429t (1) = \ln(.0319182892)$$

$$-0.429t = \ln(.0319182892)$$

$$\frac{-0.429t}{-0.429} = \frac{\ln(.0319182892)}{-0.429}$$

$$t = 8.029314929$$

t = 8 hours Round



35. The logistic model $P(t) = \frac{94.9452}{1 + 0.0327 e^{0.1548t}}$ represents the percentage of households that do not own a personal computer t years since 1986. Complete parts (a) - (d).

1986 → 0 Year (start)

(a) Evaluate and interpret $P(0)$. Evaluate $P(0)$.

$P(0) =$ _____ %

$P(0) = 94.9452 \div (1 + 0.0327 e^{(0.1548(0))})$

(Round to one decimal place as needed.)

$P(0) = 91.9388012$

Which sentence below best describes $P(0)$?

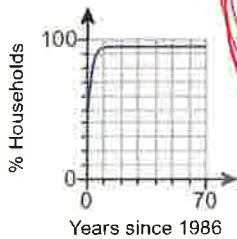
1986 year → $P(0) = 91.9$ Round without a personal computer

- A. $P(0)$ is the year no households had a personal computer.
- B. $P(0)$ is the year all households had a personal computer.
- C. $P(0)$ is the percentage of households without a personal computer in 1986.
- D. $P(0)$ is the percentage of households with a personal computer in 1986.

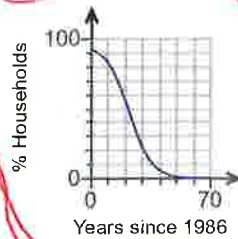
use graphing calculator

(b) Use a graphing utility to graph $P = P(t)$. Choose the correct graph below.

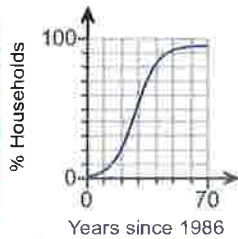
A.



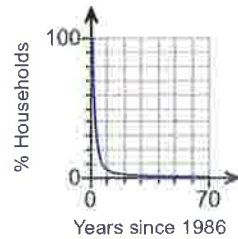
B.



C.



D.



$91 = 94.9452 \div (1 + 0.0327 e^{(0.1548x)})$

1992 - 1986

(c) What percentage of households did not own a personal computer in 1992?

In 1992, _____ % of households did not own a personal computer.

Try $x=6$ ✓ 6

(Round to one decimal place as needed.)

$P(6) = 94.9452 \div (1 + 0.0327 e^{(0.1548(6))})$

(d) In what year will the percentage of households that do not own a personal computer reach 10%?

During the year _____, the percentage of households that do not own a personal computer will reach 10%.

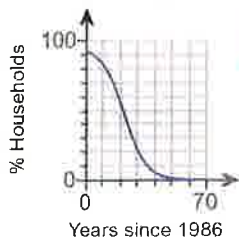
$P(t) = 87.68657713$

Year 1992 →

$P(t) = 87.7$ Round without a personal computer

Answers 91.9

C. $P(0)$ is the percentage of households without a personal computer in 1986.



B.

87.7

2021

Next page please

Use a graphing calculator

ID: 4.8.27-GC

(35) \downarrow $\frac{10}{1} = \frac{94.9452}{1 + 0.0327 e^{0.1548t}}$ (cross mult)

$$10 (1 + 0.0327 e^{0.1548t}) = 1 (94.9452)$$

$$\frac{10 (1 + 0.0327 e^{0.1548t})}{10} = \frac{94.9452}{10}$$

$$1 + 0.0327 e^{0.1548t} = 9.49452$$

$$\frac{1}{1 + 0.0327 e^{0.1548t}} = 9.49452 - 1$$

$$0.0327 e^{0.1548t} = 8.49452$$

$$\frac{0.0327 e^{0.1548t}}{0.0327} = \frac{8.49452}{0.0327}$$

$$e^{0.1548t} = 259.7712538$$

$$\ln(e^{0.1548t}) = \ln(259.7712538)$$

$$0.1548t \ln(e) = \ln(259.7712538)$$

$$0.1548t (1) = \ln(259.7712538)$$

$$0.1548t = \ln(259.7712538)$$

$$0.1548$$

$$0.1548$$

$$t = 35.91603004$$

$$1986 + 35.91603004$$

(t = 36) OR in the YEAR of 2021.91603

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

$$\begin{cases} 3x - 2y = 3 \\ 5x + y = 18 \end{cases}$$

Mult

$$\begin{array}{r} (1) \quad 3x - 2y = 3 \\ (2) \quad 10x + 2y = 36 \\ \hline 13x + 0 = 39 \end{array}$$

$$13x = 39$$

$$\downarrow \frac{13x}{13} = \frac{39}{13}$$

$$x = 3$$

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

$$3(3) - 2y = 3$$

$$9 - 2y = 3$$

$$-2y = 3 - 9$$

$$-2y = -6$$

$$\frac{-2y}{-2} = \frac{-6}{-2}$$

$$y = 3$$

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

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

ID: 6.1.33

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

$$\begin{cases} x - 2y + 3z = 11 \\ 2x + y + z = 7 \\ -3x + 2y - 2z = -15 \end{cases}$$

AND, matrix, edit(A), enter, 3x4

$$[A] = \begin{bmatrix} 1 & -2 & 3 & 11 \\ 2 & 1 & 1 & 7 \\ -3 & 2 & -2 & -15 \end{bmatrix}$$

Use graphing calculator

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(), enter*

Answer: A.

The solution is $x =$ 3, $y =$ -1, and $z =$ 2. (Type integers or simplified fractions.)

ID: 6.1.45

2nd Matrix

$$rref([A]) = \begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{bmatrix}$$

$$(x, y, z) = (3, -1, 2)$$

38. Find the sum of the sequence.

$$(9(1)+8) + (9(2)+8) + (9(3)+8) + (9(4)+8) + (9(5)+8) + (9(6)+8) = \sum_{k=1}^6 (9k+8)$$

$$(9+8) + (17+8) + (27+8) + (36+8) + (45+8) + (54+8) = \sum_{k=1}^6 (9k+8) =$$

$$(17) + (26) + (35) + (44) + (53) + (62) =$$

Answer: 237

237 = ✓
 (Math, ↓, summation Σ)
 use graphing calculator

ID: 7.1.73

39. Expand the expression using the binomial theorem.

use graphing calculator

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

$$(1)(x^4)(1) + (4)(x^3)(3) + (6)(x^2)(9) + (4)(x)(27) + (1)(1)(81) =$$

Answer: $x^4 + 12x^3 + 54x^2 + 108x + 81$

ID: 7.5.17

$$x^4 + 12x^3 + 54x^2 + 108x + 81 = \checkmark$$

40. Find the real solutions of the equation.

$$4 + \sqrt{2x-5} = x$$

$$\rightarrow \sqrt{2x-5} = x-4 \text{ Rewrite}$$

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 { 7 }.
(Simplify your answer. Use a comma to separate answers as needed.)

ID: A.8.55

$$(\sqrt{2x-5})^2 = (x-4)^2 \text{ Square both sides}$$

$$2x-5 = (x-4)(x-4)$$

$$2x-5 = x^2 - 4x - 4x + 16$$

$$2x-5 = x^2 - 8x + 16$$

$$0 = x^2 - 8x + 16 - 2x + 5$$

$$0 = x^2 - 10x + 21$$

(40) Part 2 $0 = x^2 - 10x + 21$

$$0 = (x - 3)(x - 7)$$

Let $x - 3 = 0$ OR $x - 7 = 0$

$$x - 3 + 3 = 0 + 3 \quad \text{OR} \quad x - 7 + 7 = 0 + 7$$

$x = 3$ OR $x = 7$ Check

$4 + \sqrt{2x - 5} = x$ Try $x = 3$

$$4 + \sqrt{2(3) - 5} = 3$$

$$4 + \sqrt{6 - 5} = 3$$

$$4 + \sqrt{1} = 3$$

$$4 + 1 = 3$$

$$5 \neq 3$$

BAD

$4 + \sqrt{2x - 5} = x$ Try $x = 7$

$$4 + \sqrt{2(7) - 5} = 7$$

$$4 + \sqrt{4 - 5} = 7$$

$$4 + \sqrt{9} = 7$$

$$4 + 3 = 7$$

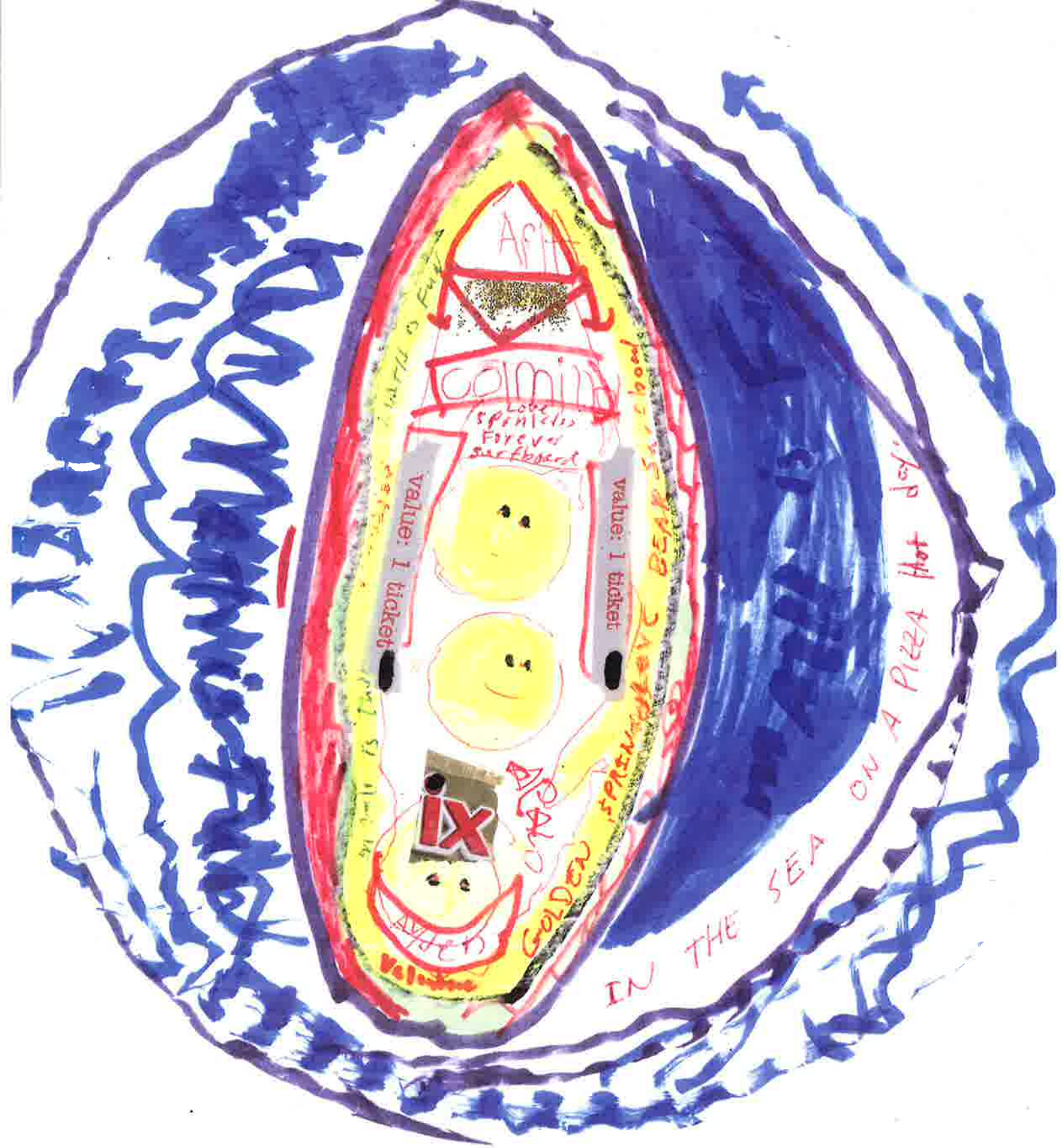
$$7 = 7$$

Good

Answer

$$x = 7$$

Only



LOVE

COMING

Love
sprinkles
Forever
surfboard

value: 1 ticket

value: 1 ticket

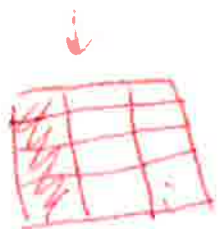


GOLDEN

IN THE SEA ON A PIZZA HOT day.



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



SMART Bird 5-8-17
AMIA

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

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

AMIA



MATH is FUN

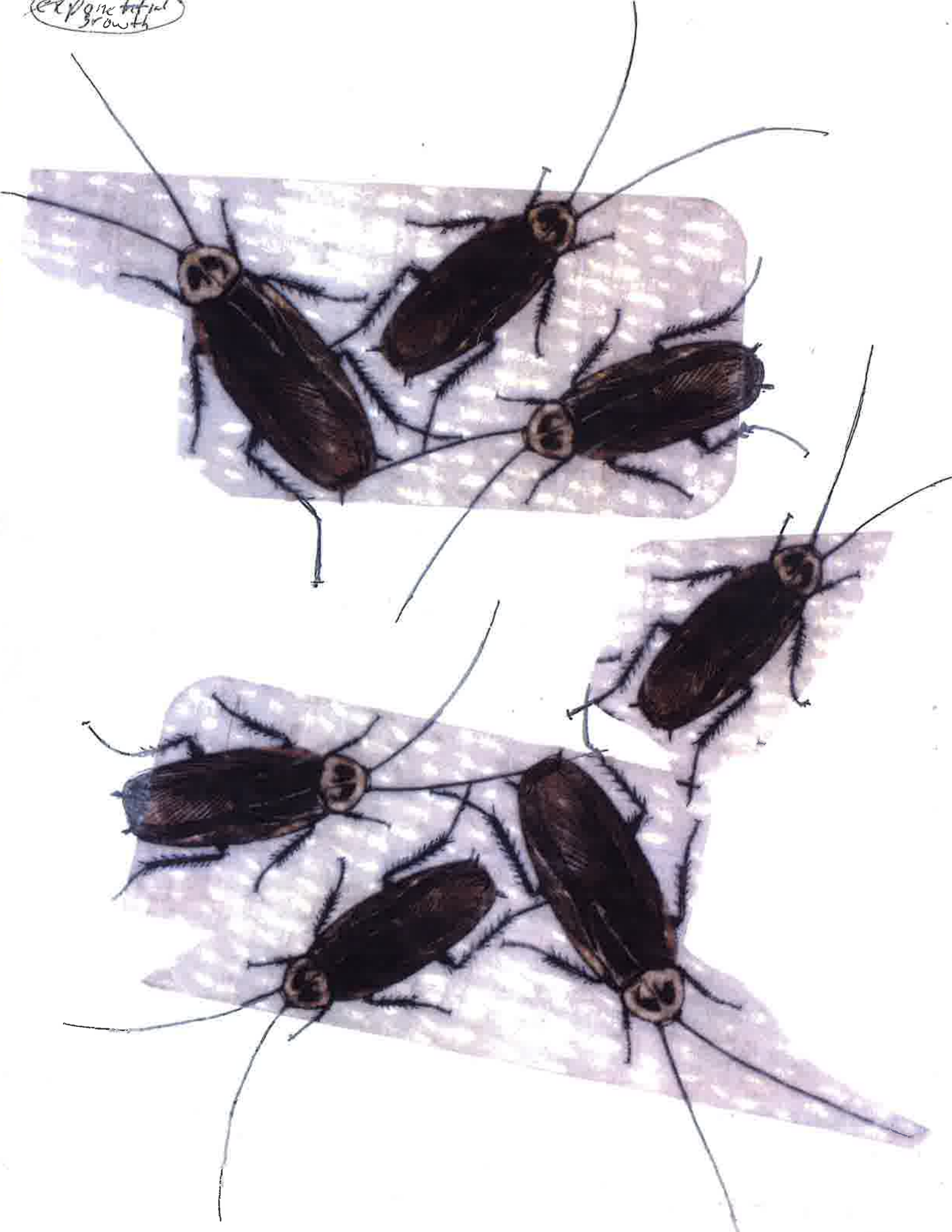
BROKEN SURFER



12/19/41



Exponential growth



exponential growth



090315w