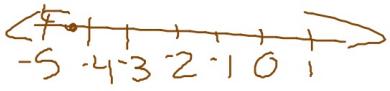
Math 3
Warm-up

Example 1

Evaluate each of the following.

a. $\lfloor 5\frac{7}{8} \rfloor$ b. $\lfloor -4.2 \rfloor$ c. $\lceil \pi \rceil$ d. $\lceil 13 \rceil$

$\pi \approx 3.14$



5 -5 4 13

e.) $|v+5|-6 < -5$

$+6 \quad +6$

$|v+5| < 1$

$-b < a < b$

$-1 < v+5 < 1$

$-5 \quad -5 \quad -5$

$-6 < v < -4$

Unit 2.3 Notes

$\{(4,2)(3,7)\}$

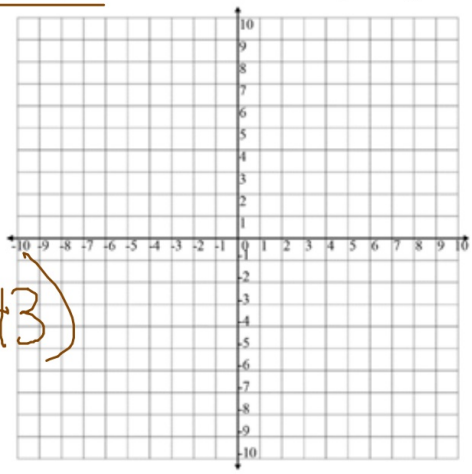
Vocabulary

Systems of Equations	a set of equations with the same unknowns.
Solution Set	a set of ordered pairs that represent the solution to an equation or system of equations.
Points of Intersection	the ordered pairs showing where the graphed functions intersect.
Dependent System	When a system of equations intersect at every point. Meaning they overlap.
Empty Set $\emptyset$ $\{\}$	When a system of equations has no real solutions. The graphs do not intersect.

Example 1:

Solve the following systems of equations. Use 3 decimal points of accuracy when reporting your answer if and exact answer cannot be found.

$$\begin{cases} f(x)=\frac{1}{2}|x-1|-2 \\ g(x)=4e^{\frac{1}{2}x}+3 \end{cases}$$



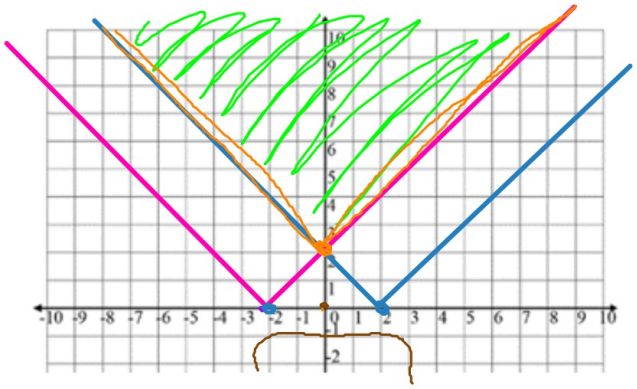
(-9.085, 3.043)

Example 2:

A single car headlight illuminates a 90° arc of area centered around the bulb. If the headlights of a certain vehicle are set 4 feet apart, write and graph an absolute value inequality that shows the area in the plane of the headlights that is illuminated by both headlights.

(0, 2)

$y \geq |x| + 2$

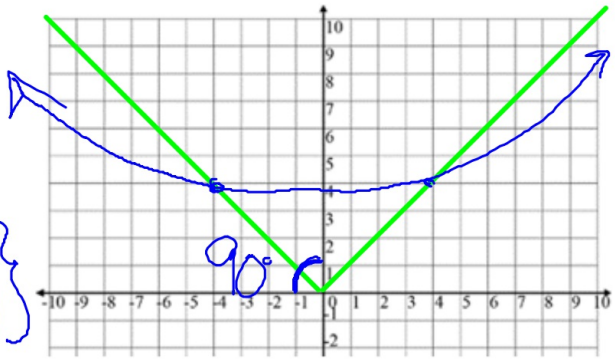


Example 3:

A puddle acts like a mirror in bright sunlight, reflecting an incoming sunbeam back towards the sky. A bird swoops down in a parabolic loop, crossing the line of reflecting light. The bird's path is modeled by the equation $b(x) = \frac{1}{16}x^2 + 3$, where x is the ground distance from the bird to the center of the puddle and $b(x)$ is the bird's height above the ground. If the sunbeam hits and reflects off the center of the puddle at a 45° angle, find the two points where the bird crosses the path of the sunbeam. Note that the angle of the light with respect to the ground is the same for incoming light and reflected light.

$y = |x|$

$\{(-4,4)(4,4)\}$



On Your Own:

Practice 2.3: Creating and Graphing Absolute Value Equations and Inequalities with Two Variables

A

Solve the following systems of equations for problems 1–3. Use 3 decimal points of accuracy when reporting your answer if an exact answer cannot be found.

1. $\begin{cases} f(x) = -3|x+1| \\ g(x) = x^2 - 6x + 5 \end{cases}$

2. $\begin{cases} f(x) = 3 \cdot 2^x - 2 \\ g(x) = 2|x| + 2 \end{cases}$

3. $\begin{cases} f(x) = x^2 - 2x - 3 \\ g(x) = \ln(x-2) + 2 \end{cases}$

Use the information that follows to complete problems 4–6.

Joe and Zoe are bouncing Ping-Pong balls toward each other off an 8-foot-high tiled ceiling. Each tile is 2 feet wide, and Joe and Zoe are standing 12 feet apart with their heads directly below a tile border. Both launch their balls from a height of 6 feet. Joe's ball hits the ceiling in the middle of the tile that is 2 tiles from the border over his head, while Zoe's ball hits the ceiling at the tile border that is 3 tiles from the border over her head.

4. Write a system of absolute value equations to model the situation, using the coordinates (0, 6) for Joe's launch point and (12, 6) for Zoe's launch point.

5. Graph the system.

6. Whose ball is easier to catch, Joe's or Zoe's?

Use the information that follows to complete problems 7 and 8.

Maria is playing miniature golf. When she hits the ball on hole 6, a chipmunk runs across the course and interrupts the ball's path. The path of the ball can be modeled by the function $f(x)=2|x-4|$, and the path of the chipmunk can be modeled by the function $g(x) = 2^x$.

7. Graph the system of equations.

8. At what point does the chipmunk cross the ball's path?

Use the information that follows to complete problems 9 and 10.

The area illuminated by a particular brand of headlight can be expressed as an absolute value inequality with a slope of 3. Two cars with this headlight drive by each other on a dark back road, and they keep a distance of 6 feet between each other as they pass.

9. Write a system of inequalities that models the area illuminated by the headlights nearest the centerline when the cars are 30 feet apart, using (0, 30) and (6, 0) as the coordinates of the headlights.

10. Graph the system and describe the area illuminated by the headlights.

Exit Ticket:
Solve and Graph these Inequalities

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

$$y=2|x-3|$$