Name: _____ Date: _____

SOLVING EQUATIONS GRAPHICALLY
COMMON CORE ALGEBRA I

As we have mentioned, there are many different ways to solve equations, i.e. find the value(s) of the variable(s) that result in the equation being true. One of the **algebraic** methods that we've seen is to use inverse operations to undo what has been done to the variable. Other sub-methods involve writing equivalent expressions and manipulating the equation with the properties of equality. Today we will see how to solve equations by using graphs (primarily created on our calculator).

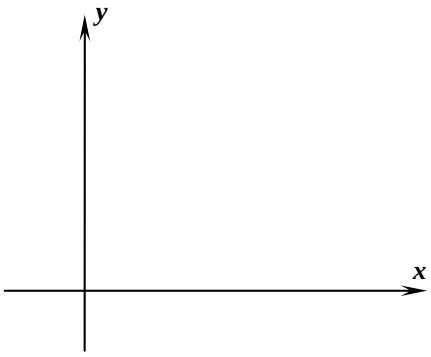
***Exercise* #1:** Consider the equation $3x-2=10-x$.

(a) Solve this equation using standard methods and then show it is a solution by checking.

(b) Using your calculator, fill out the table below for the two expressions. Circle the solution you found in (a).

x	0	1	2	3	4
$3x-2$					
$10-x$					

(c) Using your calculator, sketch a graph of the two lines $y=3x-2$ and $y=10-x$ on the axes below. Use a **WINDOW** of $-2\le x\le 6$ and $-2\le y\le 11$. Use your calculator to find their intersection point.

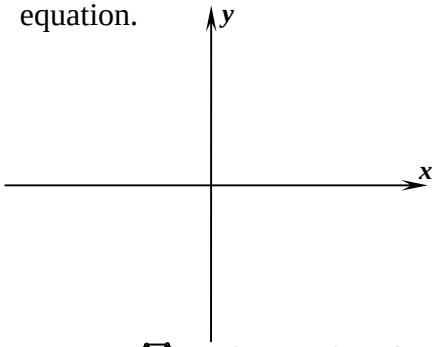


(d) **Fill in the blanks:**

To solve the equation $f(x)=g(x)$ you _____ both $f(x)$ and $g(x)$ and then find the _____ point(s) of their graphs.

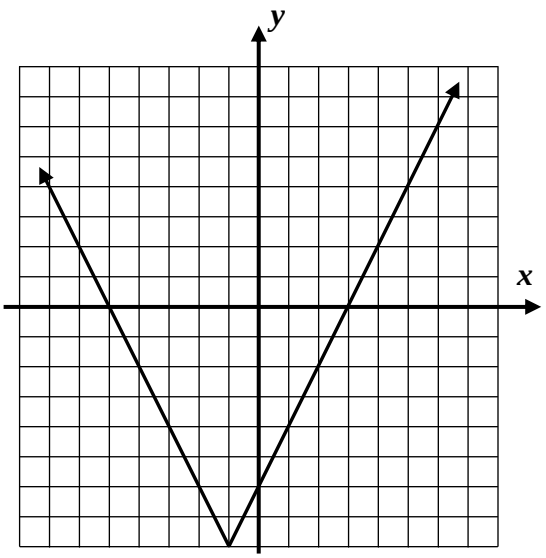
This is one of, if not the most important, equation solving technique. It literally works for all equations, although will not always result in exact answers. We can even solve equations that we don't yet have algebraic techniques for.

***Exercise* #2:** Consider the equation $x^2-11=-2x+4$. We will eventually have (multiple) algebraic methods for solving this **quadratic equation**. But for now, we will solve it graphically. Solve this equation graphically using a **WINDOW** of $-8\le x\le 8$ and $-20\le y\le 20$. Show that your answers are solutions by checking the equation.



It is important that we be able to take a graph and use it to help us solve an equation. Take a look at the next exercise which works with an absolute value equation.

Exercise #3: The function $f(x) = 2|x+1| - 8$ is shown on the grid below. Use it to help answer the following questions.



(a) Find all value(s) of *x* that solve the equation shown below. Circle points on the graph that illustrate your answer.

$2|x+1| - 8 = 0$

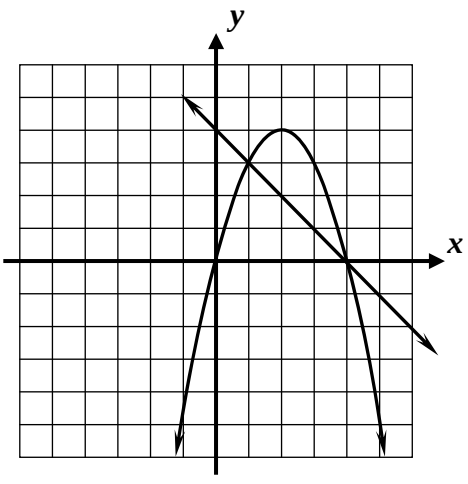
(b) Find all value(s) of *x* that solve the equation shown below. Illustrate your work on the graph.

$2|x+1| - 8 = -2$

(c) Find all value(s) of *x* that solve the equation shown below. This will necessitate a bit more work on your part. Verify that the values of *x* that you found are in fact solutions to this equation. Show the steps in your check.

$2|x+1| - 8 = x - 1$

Exercise #4: The functions $y = -x^2 + 4x$ and $y = 4 - x$ are graphed on the grid shown. Which of the following sets gives all solutions to the equation $-x^2 + 4x = 4 - x$?



(1) $\{0, 3\}$ (3) $\{1, 3\}$

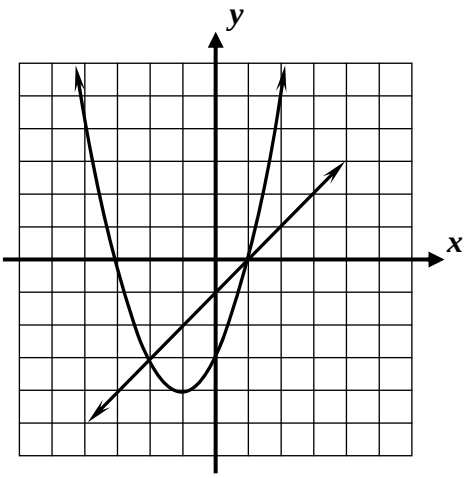
(2) $\{1, 4\}$ (4) $\{0, 4\}$

Name: _____ Date: _____

SOLVING EQUATIONS GRAPHICALLY
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. The functions $y = x^2 - 2x - 3$ and $y = x - 1$ are graphed on the grid shown below. Which of the following is the solution set of the equation:

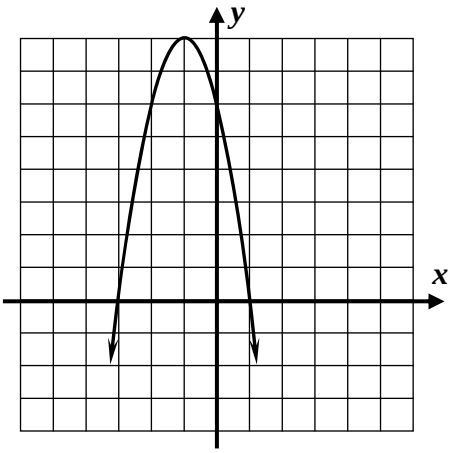


$$x^2 - 2x - 3 = x - 1$$

(1) $\{-2, 1\}$ (3) $\{-3, 0\}$

(2) $\{-3, 1\}$ (4) $\{-1, 4\}$

2. If the quadratic function $y = -2(x+1)^2 + 8$ is shown graphed below, then which of the following represents the solutions to:

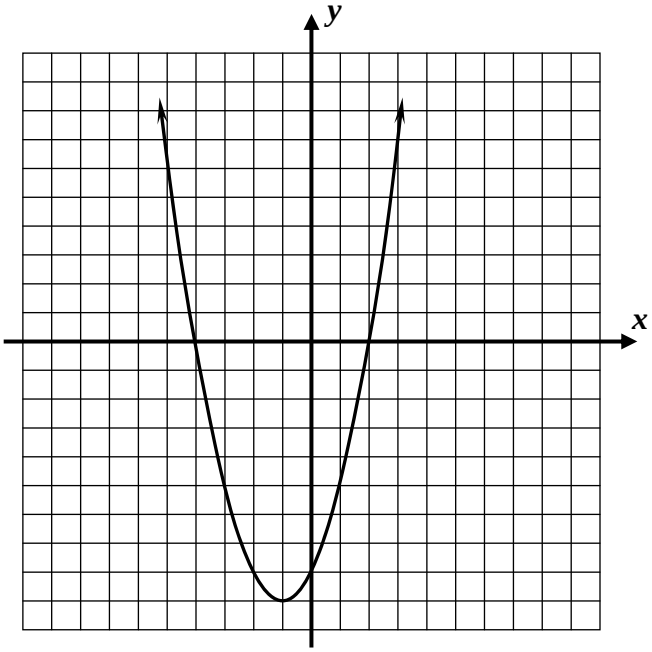


$$-2(x+1)^2 + 8 = 0$$

(1) $x = 0, 3$ (3) $x = -2, 2$

(2) $x = -4, 8$ (4) $x = -3, 1$

3. The quadratic function $f(x) = x^2 + 2x - 8$ is shown graphed on the grid below.



(a) What values of x solve the equation $x^2 + 2x - 8 = 0$ based on this graph?

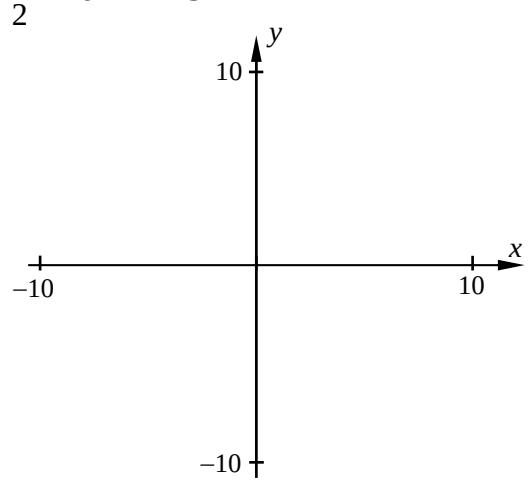
(b) Graph the line $g(x) = 2x + 1$ on the grid.

(c) What values of x solve the equation:

$$x^2 + 2x - 8 = 2x + 1$$

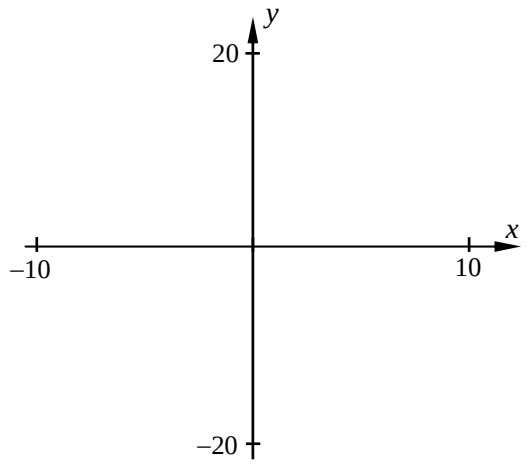
4. For each of the following equations, use your calculator to solve by graphing both sides of the equation and finding the x-coordinate(s) of intersection as done in Exercise #2. Use the **WINDOW** indicated by the particular a and sketch a graph to illustrate your answers.

(a) $-\frac{1}{2}x+6=4x-3$



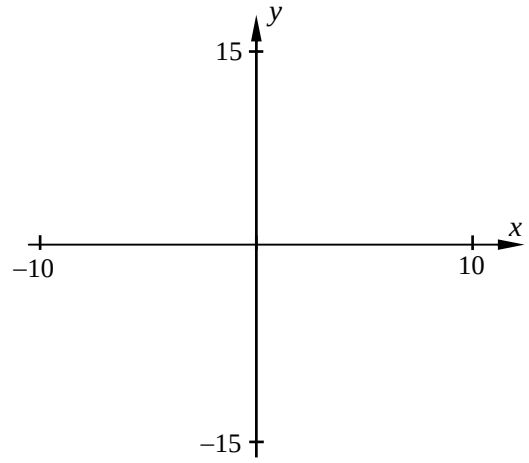
Solution(s): _____

(b) $x^2-7x-7=-3x+5$



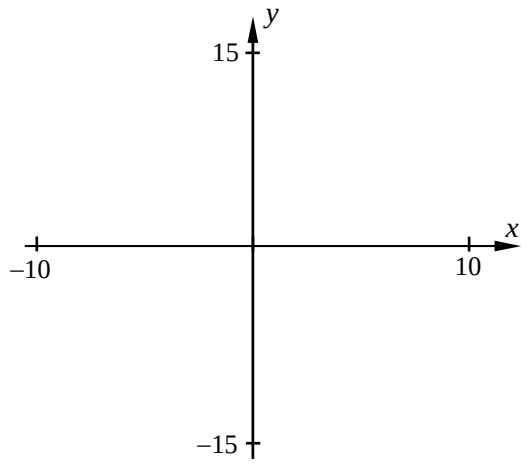
Solution(s): _____

(c) $x^2-8=|2x|$



Solution(s): _____

(d) $x^2+4x-6=-x^2+5x+4$



Solution(s): _____

REASONING

5. The graphs of two functions, $f(x)$ and $g(x)$, intersect only twice. Selected values of the functions are shown in the table below. Based on the table, state the solutions to the equation:

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

Solutions: _____

x	–2	–1	0	1	2	3
$f(x)$	7	3	–2	–8	0	5
$g(x)$	–8	3	5	1	0	–3