PC 11 7.2 ABSOLUTE VALUE FUNCTIONS

INVESTIGATE: ABSOLUTE VALUE FUNCTIONS

PART A: COMPARE LINEAR FUNCTIONS WITH CORRESPONDING ABSOLUTE VALUE FUNCTIONS.

- **Consider the functions f(x) = x and g(x) = |x|**

1) Complete each table of values

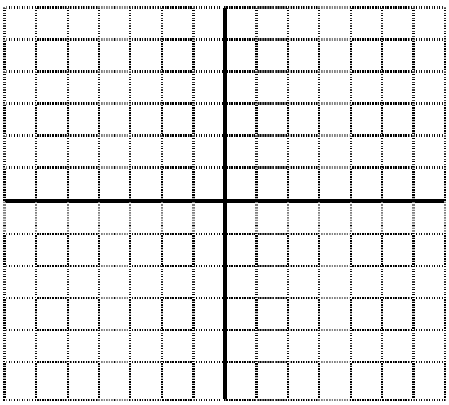
LINEAR

x	f(x)
-3	
-2	
-1	
0	
1	
2	
3	

ABSOLUTE VALUE

x	g(x)
-3	
-2	
-1	
0	
1	
2	
3	

2) Graph each function on the grid



3) Which characteristics of the two graphs are similar and which are different?

4) From the graph explain why the absolute value of a function is a function.

5) a) Describe the shape of the graph of g(x).

b) If you could sketch the graph of g(x) using two linear functions, what would they be? Are there any restrictions on the domain and range of each function?

PART B: COMPARE QUADRATIC FUNCTIONS WITH CORRESPONDING ABSOLUTE VALUE FUNCTIONS.

$y = ax^2 - bx + c$

- **Consider the functions $f(x) = x^2 - 4$ and $h(x) = |x^2 - 4|$**

1) Complete each table of values

PARABOLA

~~LINEAR~~

x	f(x)
-3	5
-2	0
-1	-3
0	-4
1	-3
2	0
3	5

change

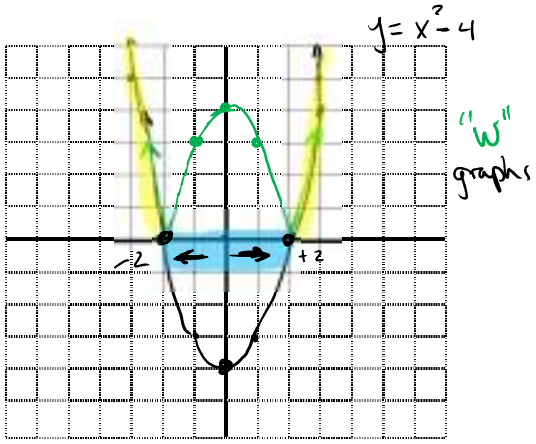
$V(0,-4)$

$y = |x^2 - 4|$

ABSOLUTE VALUE

x	h(x)
-3	5
-2	0
-1	3
0	4
1	3
2	0
3	5

2) Graph each function on the grid



3) Which characteristics of the two graphs are similar and which are different?

The upper "arms" are the same

The vertex is different

4) a) For what values of the graphs of f(x) and h(x) the same? different?

b) If you could sketch the graph of h(x) using two quadratic functions, what would they be? Are their any restrictions on the domain and range of each function?

piecewise

$$y = |x^2 - 4| = \begin{cases} x^2 - 4, & x \geq 2 \text{ or } x \leq -2 \\ -(x^2 - 4), & -2 < x < 2 \end{cases}$$

CONCLUSION: How is the graph of a linear or quadratic function related to its corresponding absolute value graph?

ABSOLUTE VALUE FUNCTION

- A function that involves the absolute value of a a variable
- $y = |x| = \begin{cases} x, & if\ x \geq 0 \\ -x, & if\ x < 0 \end{cases}$ This is a piecewise function.

Piecewise function: a function composed of two or more separate pieces
each piece with its own specific domain
the pieces combine to define the overall function.

Invariant point: a point that remains unchanged when a transformation is applied to it.

GRAPH AN ABSOLUTE VALUE FUNCTION OF THE FORM y = | ax + b |

EX. 1 Consider the absolute value function $y = |2x - 3|$.

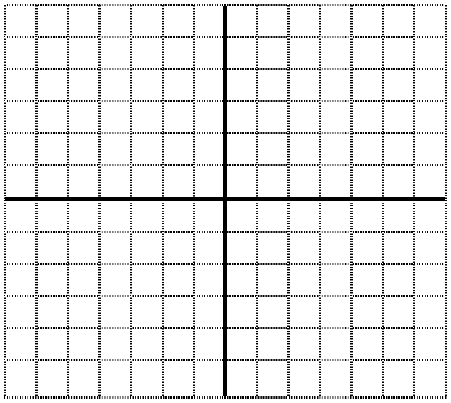
a) Determine y-intercept and x-intercept

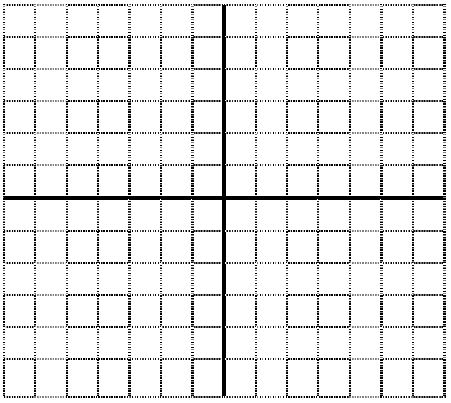
b) Sketch the graph

Method 1: Using a Table of Values

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

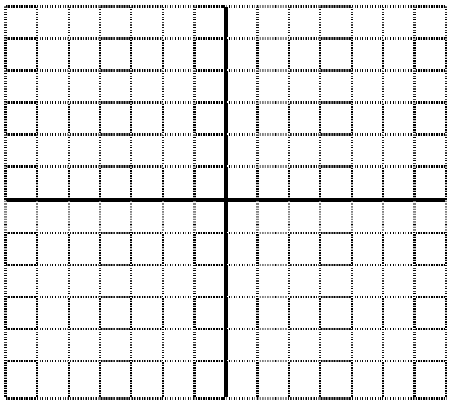
Method 2: Using the graph of y = 2x - 3





c) State the domain and range

d) Express as a piecewise function



See Example 1 & Your Turn **p. 371-372**

GRAPH AN ABSOLUTE VALUE FUNCTION OF THE FORM $y = |ax^2 + bx + c|$

opening down ↓ ✓ y int

EX. 2 Consider the absolute value function $y = |-x^2 + 2x + 8|$.

a) Determine y-intercept and x-intercepts Standard form

x int Set y = 0

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

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

$0 = -1(x-4)(x+2)$

$0 = (x-4)(x+2)$ x int: 4 & -2

b) Sketch the graph

Method 1: Using a Table of Values

x	$y = \|-x^2 + 2x + 8\|$
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Complete the square !!!

Method 2: Using Vertex Form

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

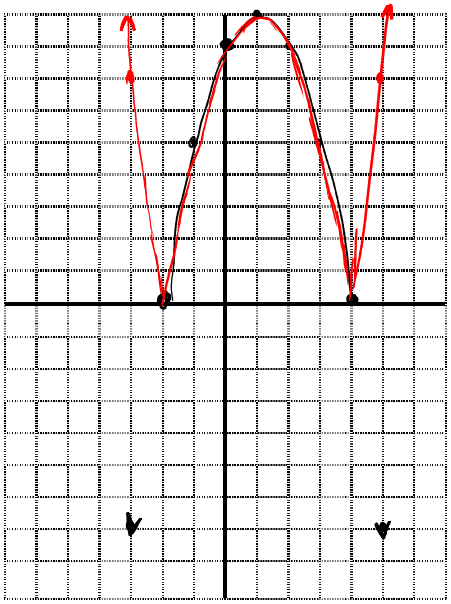
$y = (-x^2 + 2x) + 8$

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

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

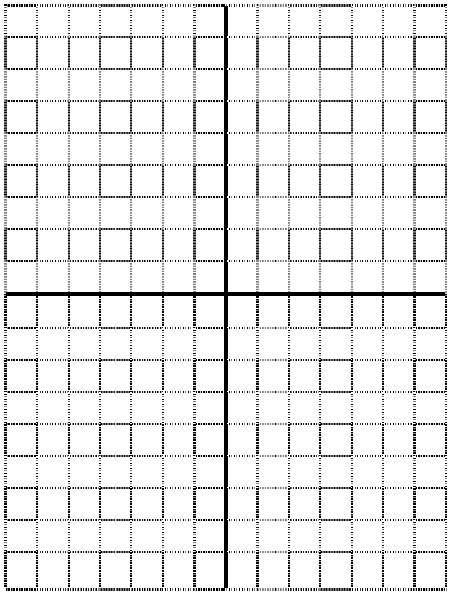
$y = -(x-1)^2 + 1 + 8$

$y = -(x-1)^2 + 9$ $V(1, 9)$



"W"

$y = |-x^2 + 2x + 8|$



c) State the domain and range

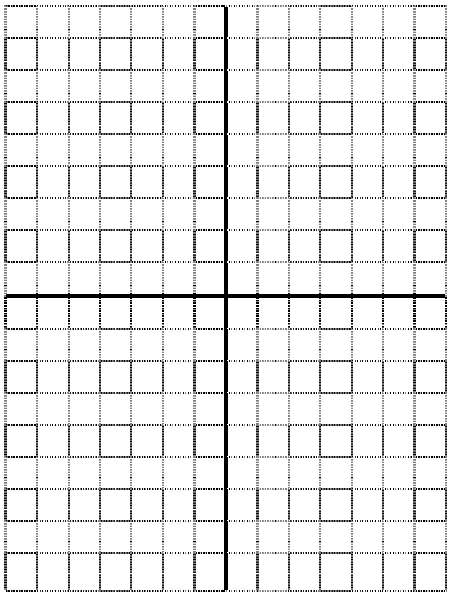
$x \in R$

$y \geq 0$

d) Express as a piecewise function

$y = |-x^2 + 2x + 8|$

$$\begin{cases} -x^2 + 2x + 8, & -2 \leq x \leq 4 \\ -(-x^2 + 2x + 8) & x < -2 \text{ or } x > 4 \end{cases}$$



See Example 2 & Your Turn **p. 372-374**

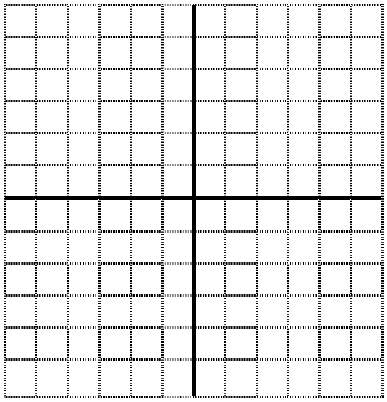
ASSIGNMENT:

1) **p. 375** read Key Ideas
2) **w/s** 7.2
3) **p.** 375-379 # 2, 4, 6, 8, 9, 10ace, 15, 18, 19, 22, 26

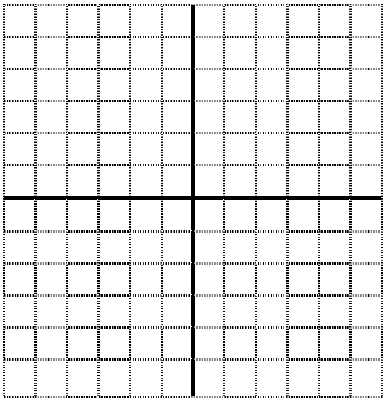
PC 11 w/s **7.2 ABSOLUTE VALUE FUNCTIONS**

- Show all work (diagrams, explanations, calculations… etc)

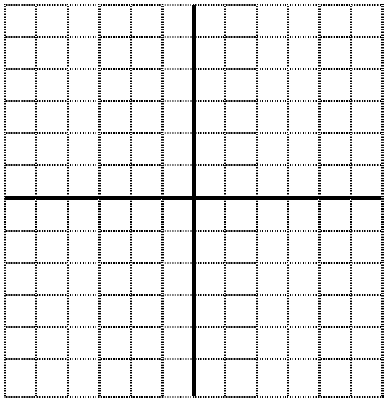
1. For each equation
   - Graph y = f(x)
   - Sketch the graph of function $y = |f(x)|$ on the same grid.
   - What piecewise function represent each graph of an absolute value function
   - Check your answers on your graphing calculator MATH → NUM 1:ABS



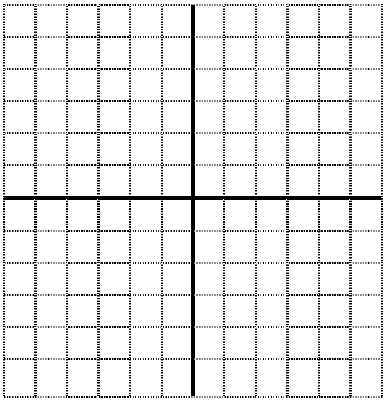
$y = \frac{1}{2}x + 1$



$y = -2x + 2$



$y = x^2 - 1$



$y = (x + 3)^2 - 4$