

8.1A Graphs of Absolute Value Functions

#1 – 6: Using a graphing utility, determine whether the graph of each equation opens up or down. Identify the vertex and the axis of symmetry.

1. $y = |x + 2| - 6$

Opens: upAxis of symmetry: $x = -2$ Vertex: $(-2, -6)$

2. $y = -|x - 3| + 4$

Opens: downAxis of symmetry: $x = 3$ Vertex: $(3, 4)$

3. $y = 2|x - 5| - 4$

Opens: upAxis of symmetry: $x = 5$ Vertex: $(5, -4)$

4. $y = -2|x - 2| - 5$

Opens: downAxis of symmetry: $x = 2$ Vertex: $(2, -5)$

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

Opens: downAxis of symmetry: $x = 1$ Vertex: $(1, -4)$

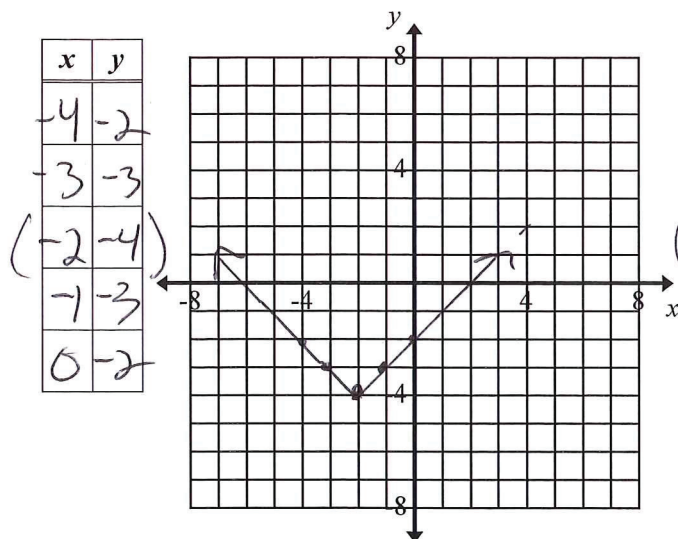
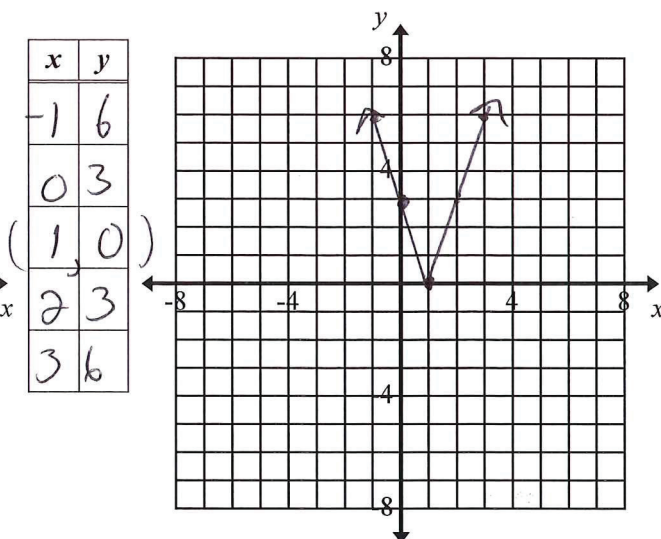
6. $y = \frac{1}{4}|x - 2| + 4$

Opens: upAxis of symmetry: $x = 2$ Vertex: $(2, 4)$

#7 – 12: Graph the absolute value function AND identify the domain and range.

7. $y = |x + 2| - 4$

8. $y = 3|x - 1|$

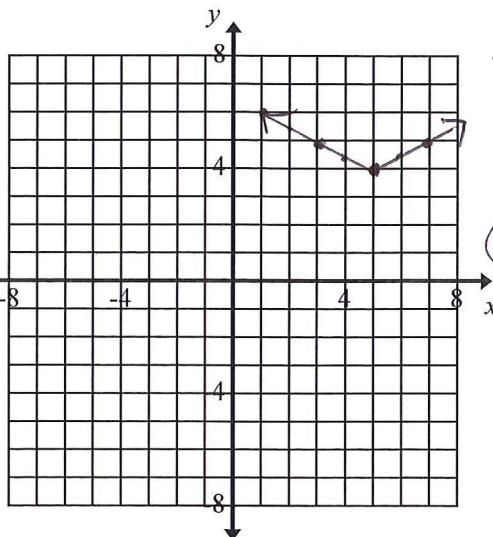
Domain: $\mathbb{R}$ Range: $y \geq -4$ Domain: $\mathbb{R}$ Range: $y \geq 0$

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#7 – 12 (continued): Graph the absolute value function AND identify the domain and range.

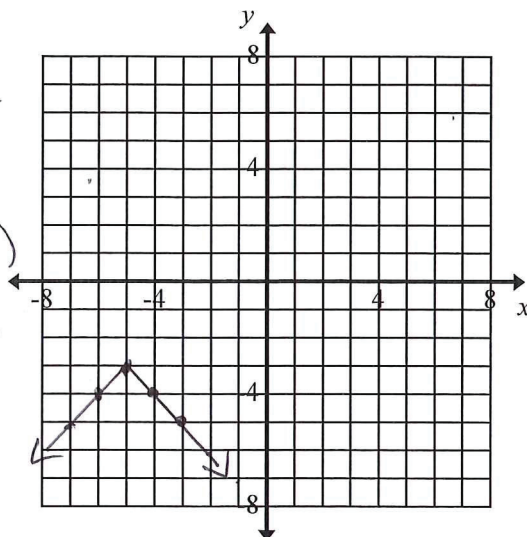
9. $y = \frac{1}{2}|x-5| + 4$

x	y
3	5
4	4.5
(5) 4	
6	4.5
7	5

Domain: $\mathcal{R}$ Range: $y \geq 4$

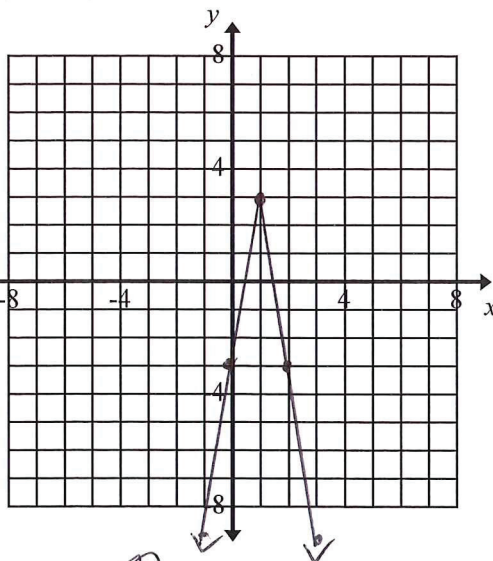
10. $y = -|x+5| - 3$

x	y
-7	-5
-6	-4
(-5) -3	
-4	-4
-3	-5

Domain: $\mathcal{R}$ Range: $y \leq -3$

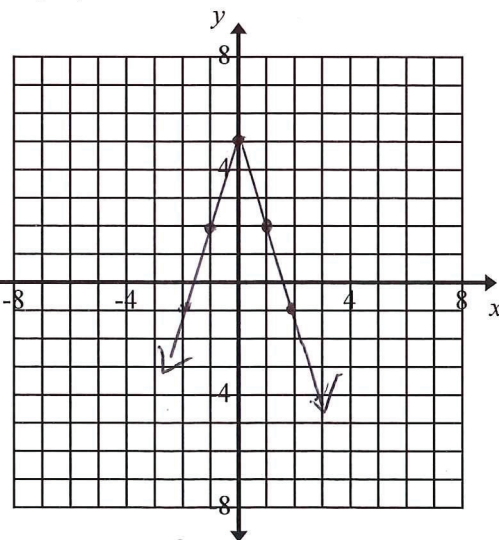
11. $y = -2|3x-3| + 3$

x	y
1	-9
0	-3
(1) 3	
2	-3
3	-9

Domain: $\mathcal{R}$ Range: $y \leq 3$

12. $y = 5 - |3x|$

x	y
-2	-1
-1	2
(0) 5	
1	2
2	-1

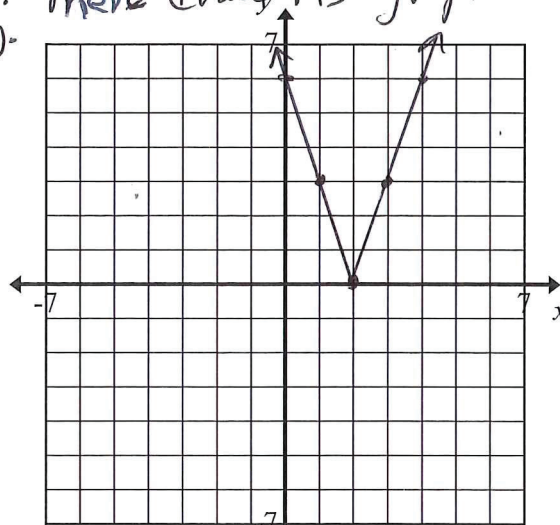
Domain: $\mathcal{R}$ Range: $y \leq 5$ 13. Without graphing the equation $y = 2|x-4| + 3$, answer the following:What is the domain of the graph of the equation? $\mathcal{R}$ What is the range of the graph of the equation? $y \geq 3$

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#14 – 15: Identify several significant features (vertex location, opening, domain, range, steepness, etc.) of the graph of the equation, then match the function and the graph (draw a line from the equation to the correct graph): the absolute value function. Then draw its graph without a graphing utility.

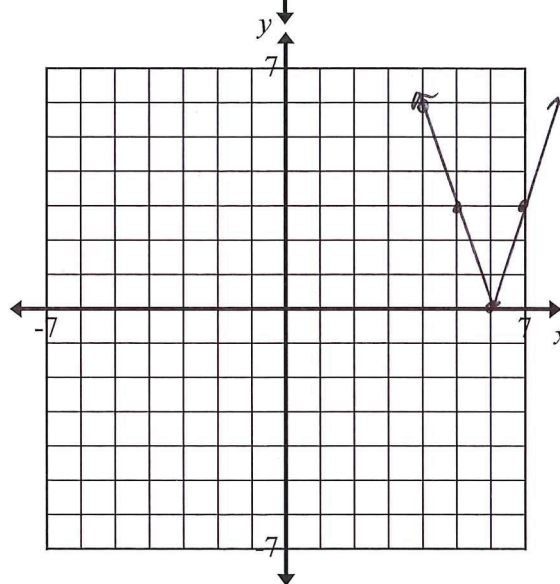
14. $y = |3x - 6|$

- > vertex (2, 0)
- > opens up
- > domain all $\mathbb{R}$
- > range $y \geq 0$
- > fairly steep with slope of 3 on one side



15. $y = 3|x - 6|$

- > vertex 6, 0
- > opens up
- > domain all $\mathbb{R}$
- > range $y \geq 0$
- > fairly steep with a slope of 3 on one side.



16. What do you notice that is the same between the equations of problems 14 and 15?

Same Domain and range, opening up, same steepness (slope 3)

17. What do you notice that is different between the equations of problems 14 and 15?

There are 2 different expressions inside the absolute value.
Second equation has a coefficient of 3 outside the absolute value.

18. How do the differences influence the x-coordinate of the vertex?

Setting 2 unequal expressions inside the absolute value equal to zero and solving gives 2 different x-coordinates for the vertex.

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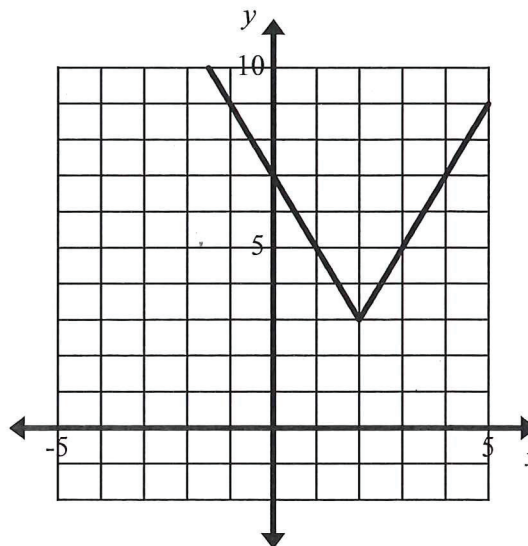
19. Which of the following equation(s) is/are graphed to the right?

[A] $y = |2x - 1| + 3$

[B] $y = 2|x - 2| + 3$

[C] $y = |2x - 2| + 3$

[D] $y = 2|x - 3| + 3$



20. Which pair of linear equations, along with restrictions, represents the equation: $y = |x + 4| - 5$?

[A] $y = x - 1$ for $x \geq -4$

$y = -x - 1$ for $x < -4$

[B] $y = -x - 9$ for $x \geq -4$

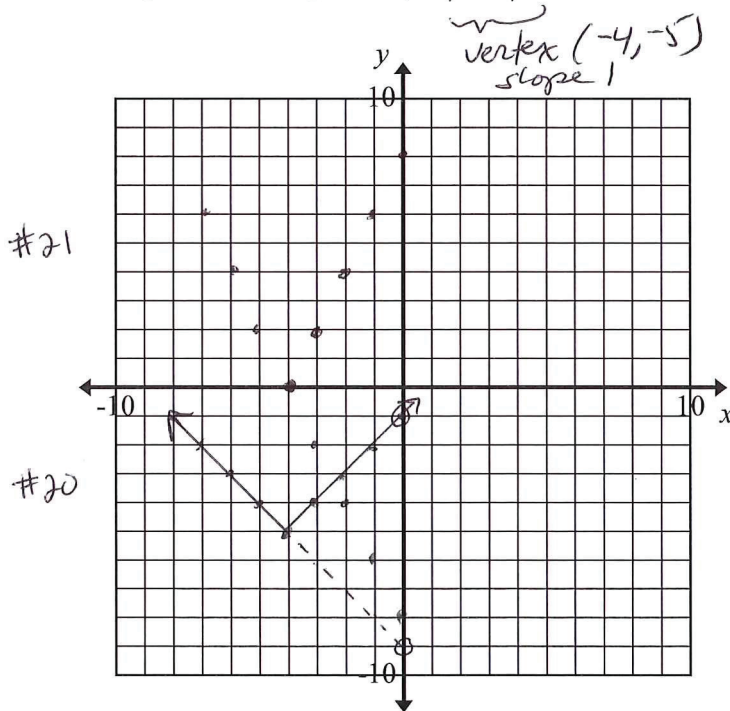
$y = x - 1$ for $x < -4$

[C] $y = -x - 1$ for $x \geq -4$

$y = x - 1$ for $x < -4$

[D] $y = x - 1$ for $x \geq -4$

$y = -x - 9$ for $x < -4$



21. What two linear equations, along with restrictions, duplicates the graph of $y = |2x + 8|$?

$y = 2x + 8$ for $x \geq -4$

$y = -2x - 8$ for $x < -4$

vertex $(-4, 0)$
slope 2
 $y = 2|x + 4|$

Section 8.1A