Day 20

2-5 Absolute Value Functions and Graphs

$y = |x|$

calculator: [y=] [math] → Num abs

$y = abs(x)$

$y = |x| + 3$ moved up 3

$y = |x+3|$ moved left 3

$y = |2x-4|$ moved right 2

Set what is inside the absolute value bars equal to zero and solve for x to find the x-value of the vertex. The y-value is whatever is outside the bars, if there is nothing y is zero.

$2x - 4 = 0$
$+4 \quad +4$
$\frac{2x}{2} = \frac{4}{2}$
$x = 2$

vertex (2,0)

$y = -|x+1| - 2$ ← y-value OF the vertex also tells you it it moves up or down

$x + 1 = 0$
$-1 \quad -1$
$x = -1$

vertex $(-1, -2)$

move left 1, and down 2

$y = -|x+1|$ ↑ reflection over the x-axis (open down)

$y = |2x-5| + 0$ vertex $(2.5, 0)$

$2x - 5 = 0$
$+5 \quad +5$
$\frac{2x}{2} = \frac{5}{2}$
$x = 2.5$

moves right 2.5

$y = \left|\frac{3}{2}x + 4\right| - 3$ vertex $(-2\frac{2}{3}, -3)$

$\frac{3}{2}x + 4 = 0$
$-4 \quad -4$
$\frac{3}{3}x = -4 \cdot \frac{2}{3}$
$x = -\frac{8}{3}$ or $-2\frac{2}{3}$

left $2\frac{2}{3}$, down 3

$y = -|-x| + 5$ vertex $(0, 5)$

reflection

$\frac{-1x}{-1} = \frac{0}{-1}$
$x = 0$

up 5

$y = 2 - |x+1|$ vertex $(-1, 2)$

up 2

reflection

$x + 1 = 0$
$-1 \quad -1$
$x = -1$

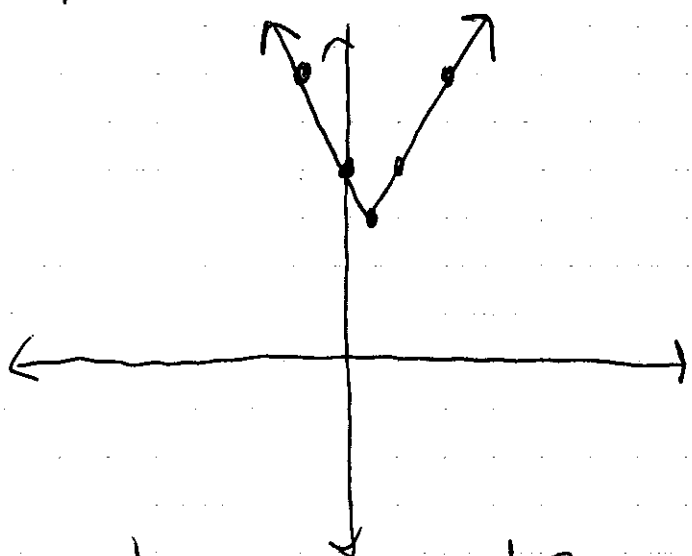
left 1

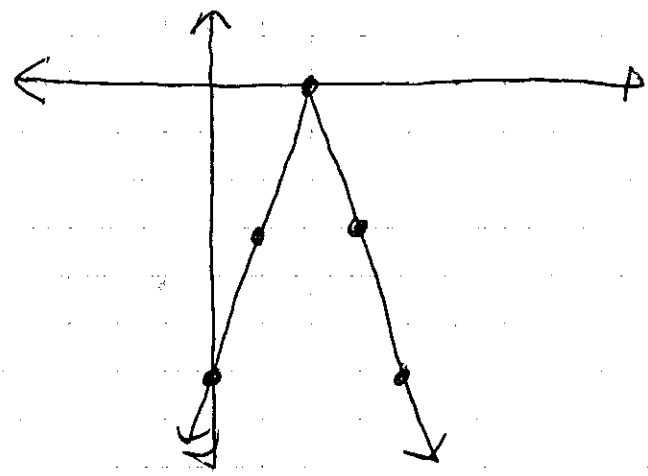
Graph $y = |2x-1| + 3$

$2x - 1 = 0$
$+1 \quad +1$
$\frac{2}{2}x = \frac{1}{2} \quad x = \frac{1}{2}$

vertex $(\frac{1}{2}, 3)$

x	y	
-1	$y = \|2\cdot(-1)-1\| + 3 = \|-3\| + 3 = 3+3 = 6$	$(-1,6)$
0	$y = \|2\cdot 0 - 1\| + 3 = \|-1\| + 3 = 1+3 = 4$	$(0,4)$
$\frac{1}{2}$	3	
1	$y = \|2\cdot 1 - 1\| + 3 = \|1\| + 3 = 1+3 = 4$	$(1,4)$
2	$y = \|2\cdot 2 - 1\| + 3 = \|3\| + 3 = 3+3 = 6$	$(2,6)$





Graph. $y = -|3x-6|$ vertex $(2,0)$

$3x - 6 = 0$
$+6 \quad +6$
$\frac{3x}{3} = \frac{6}{3}$
$x = 2$

x	y
0	$-\|3\cdot 0 - 6\| = -\|-6\| = -6$
1	$-\|3\cdot 1 - 6\| = -\|-3\| = -3$
2	0
3	$-\|3\cdot 3 - 6\| = -\|3\| = -3$
4	$-\|4\cdot 3 - 6\| = -\|6\| = -6$

$$y = 6 + 2|3x+1|$$

OR

$$y = 2|3x+1| + 6 \leftarrow y\text{-value}$$

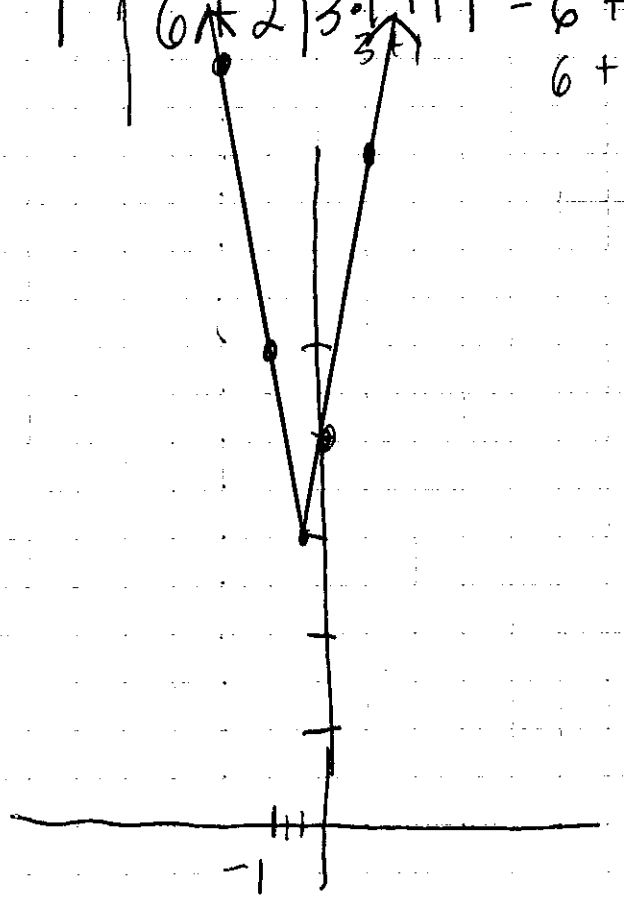
steeper ↑

$3x+1=0$ vertex $(-\frac{1}{3}, 6)$

$-1 \quad -1$

$\frac{3x}{3} = \frac{-1}{3}$

x	y
-2	$6+2\lvert 3\cdot -2+1\rvert = 6+2\lvert -5\rvert = 6+2\cdot 5 = 16$ $-6+1 \qquad 6+10$
-1	$6+2\lvert 3\cdot -1+1\rvert = 6+2\lvert -2\rvert = 6+2\cdot 2 = 10$ $-3+1 \qquad 6+4$
$-\frac{1}{3}$	6
0	$6+2\lvert 3\cdot 0+1\rvert = 6+2\lvert 1\rvert = 6+2 = 8$ $0+1 \qquad 6+2\cdot 1$
1	$6+2\lvert 3\cdot 1+1\rvert = 6+2\lvert 4\rvert = 6+8 = 14$ $3+1 \qquad 6+2\cdot 4$

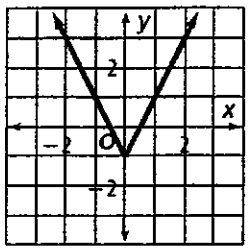


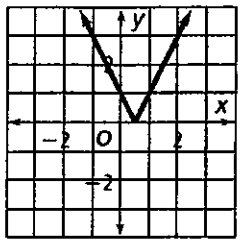
Name _____ Class 1 Date 2/17

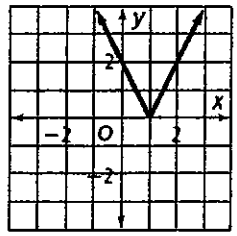
Alg.2 Practice 2-5 — Absolute Value Functions and Graphs

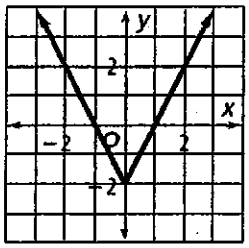
Match each equation with its graph. Find the vertex

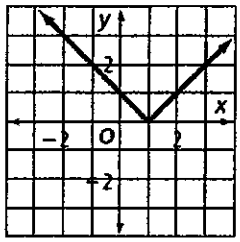
1. $y = |x - 1|$ _____
2. $y = 2|x - 1|$ _____
3. $y = |2x| - 1$ _____
4. $y = |x| - 1$ _____
5. $y = |2x - 1|$ _____
6. $y = |2x| - 2$ _____

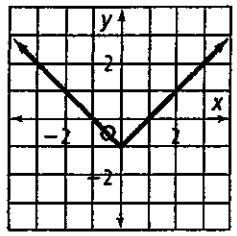
A. 

B. 

C. 

D. 

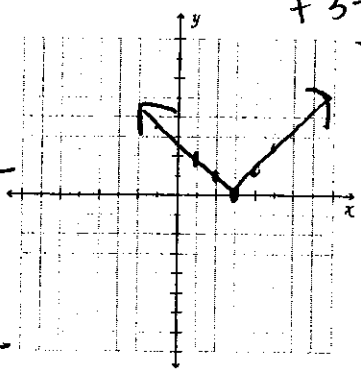
E. 

F. 

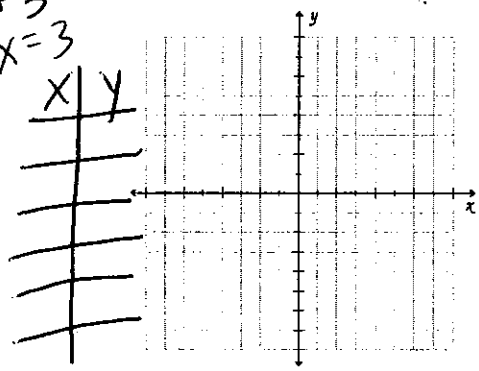
Graph each equation by writing two linear equations.

7. $y = |x - 3|$ $x - 3 = 0$, $+3 + 3$, $x = 3$

x	y
1	2
2	1
3	0
4	1
5	2

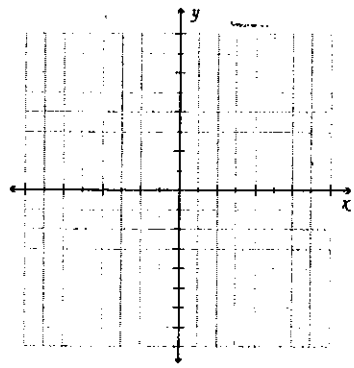


x	y

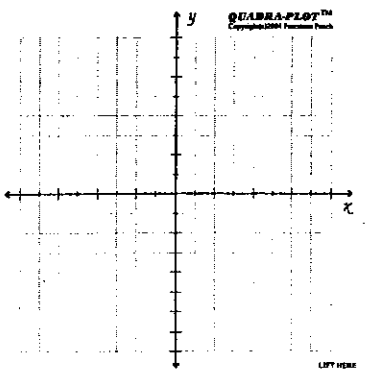


8. $y = |2x - 5|$

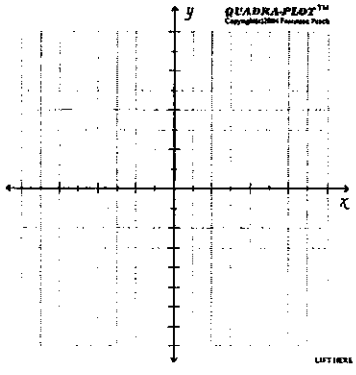
9. $y = 2|x + 2|$



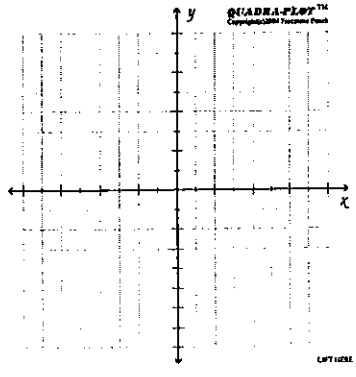
10. $y = |x + 3| - 1$



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

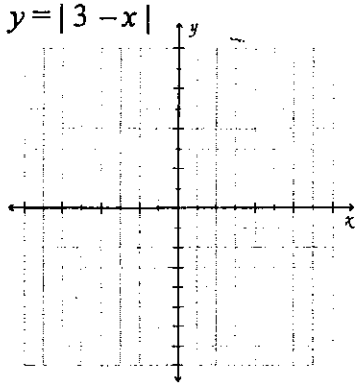


12. $y = \left|\frac{1}{2}x - 2\right| + 1$

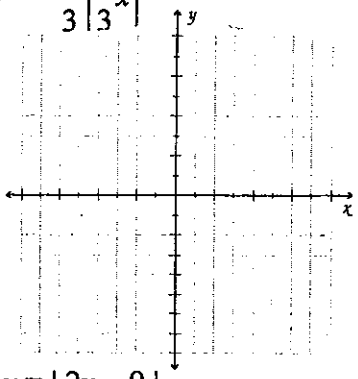


Graph each absolute value equation.

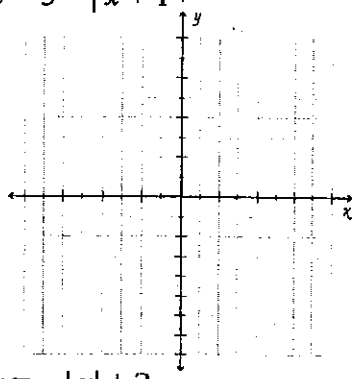
13. $y = |3 - x|$



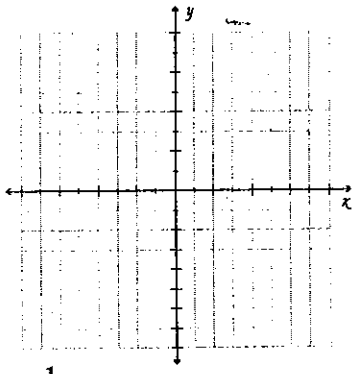
14. $y = -\frac{2}{3}\left|\frac{1}{3}x\right|$



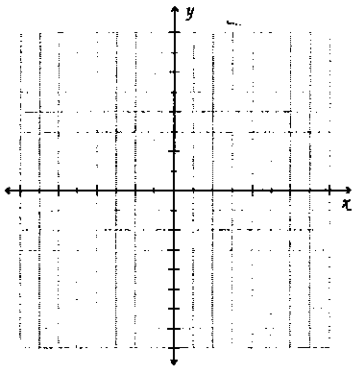
15. $y = 3 - |x + 1|$



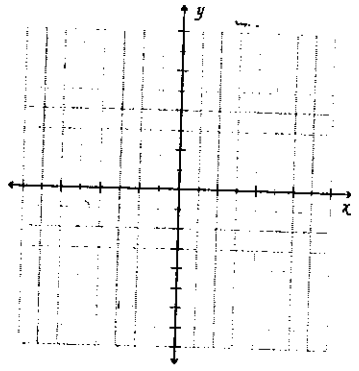
16. $y = -|-x - 2|$



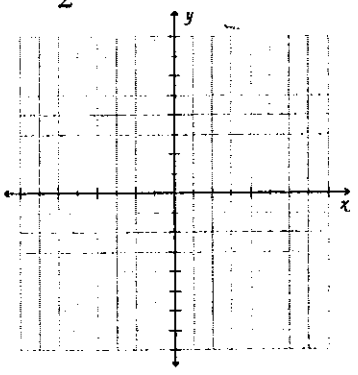
17. $3y = |2x - 9|$



18. $y = -|x| + 2$

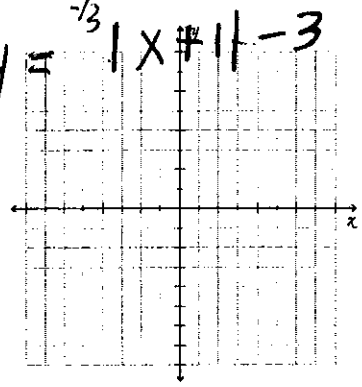


19. $\frac{1}{2}y = |3x - 1| - 2$

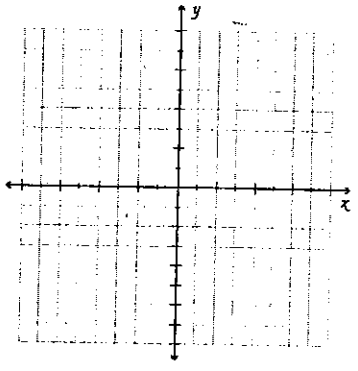


20. $y + 3 = |x + 1| - 3$

$y = |x + 1| - 3$



21. $-2y = |2x - 4|$



Alg.2 Practice 2-6 — Families of Functions

Describe each translation of $f(x) = |x|$ as vertical, horizontal, or combined.

1. $f(x) = |x + 2|$

_____

2. $f(x) = |x + 4|$

_____

3. $f(x) = |x| - 5$

_____

4. $f(x) = |x + 1| - 1$

_____

5. $f(x) = |x - 2| + 1$

_____

6. $f(x) = \left|x - \frac{3}{2}\right|$

_____