2.6 Families of Functions ⇒ absolute values

Parent function	$y = \|x\|$
Reflect across the x-axis	$y = -\|x\|$
vertical stretch $a > 1$	$y = a\|x\|$
vertical shrink $0 < a < 1$ (fraction)	$y = a\|x\|$
reflection & a vertical stretch/shrink	$y = -a\|x\|$
horizontal shift left	$y = \|x + h\|$
right →	$y = \|x - h\|$
vertical translation ↑ up	$y = \|x\| + k$
↓ down	$y = \|x\| - k$

Put it all together: Vertex Form $y = a|x - h| + k$

(h, k)

$f(x) = |x|$ followed by a transformation — what is the new equation?

left 2 — $f(x) = |x + 2|$

vertex (0, 5) — $f(x) = |x| + 5$

Rt 4, up 5 — $f(x) = |x - 4| + 5$

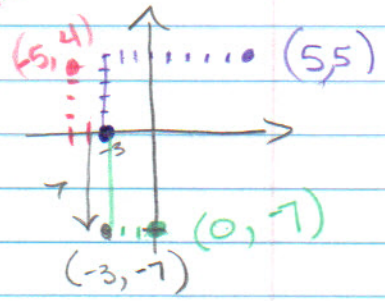
vertex (−1, 9) — $f(x) = |x + 1| + 9$

Rt 2 down 12 — $f(x) = |x - 2| - 12$

Reflected across x-axis (−15, −8) — $f(x) = -|x + 15| - 8$

vertical stretch < 1, Rt 2 up 3 — $y = \frac{1}{4}|x - 2| + 3$

Transformed graph of $f(x) = |x+3|$ $(-3,0)$



transform some more:

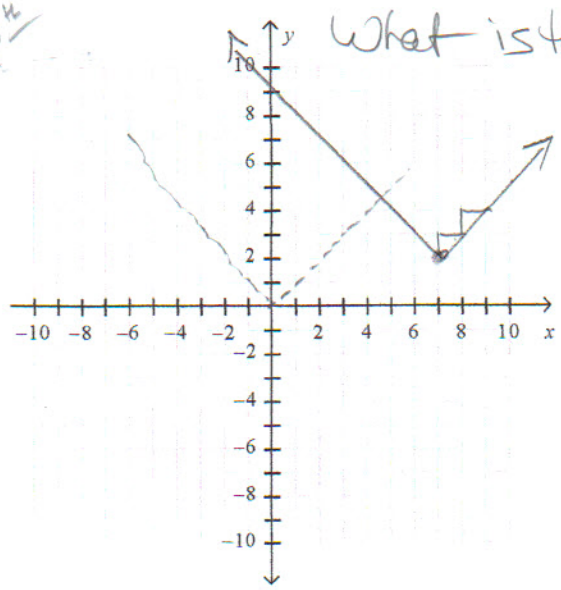
① down 7 units $y = |x+3| - 7$
new vert $(-3, -7)$

② Up 5, Rt 8 $y = |x-5| + 5$
$(5,5)$

③ down 7 Rt 3 $y = |x| - 7$
$(0, -7)$

④ left 2, Up 4 $y = |x+5| + 4$
$(-5, 4)$

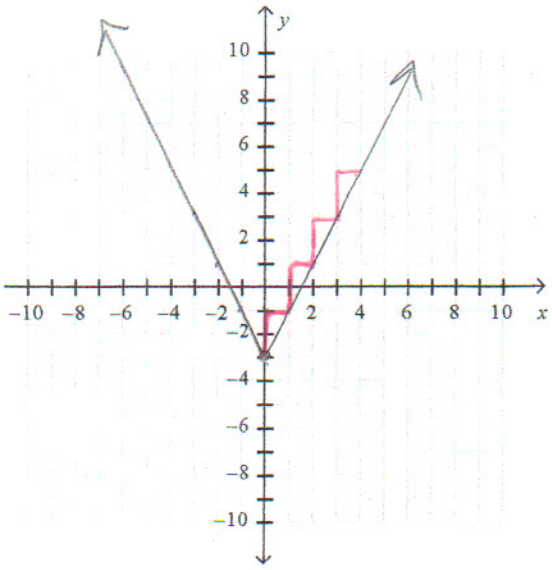
What is the equation?, vertex?



Vertical stretch? $a=1$? yes

$(7, 2)$

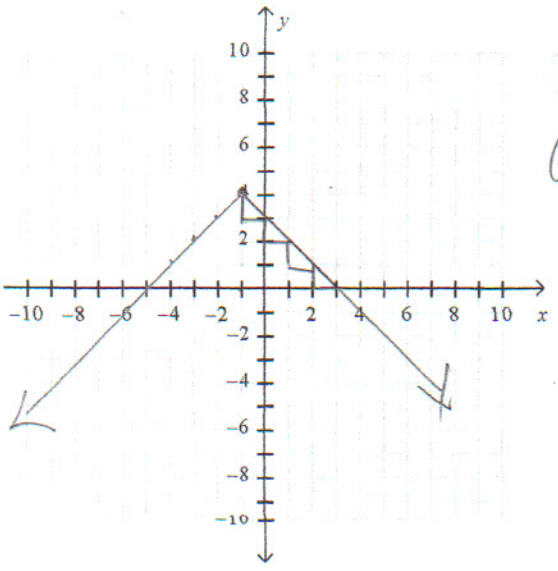
$y = |x - 7| + 2$



$a=1$? No $a=2$

$(0, -3)$

$y = 2|x| - 3$



Reflection

$a = -1$

$(-1, 4)$

$y = -|x + 1| + 4$

2.7 Absolute Value Inequalities

Graph:

$y < |x+2| - 2$ vertex $(-2, -2)$

$<$ or $>$ dashed line

$\geq$ $\leq$ equality solid line

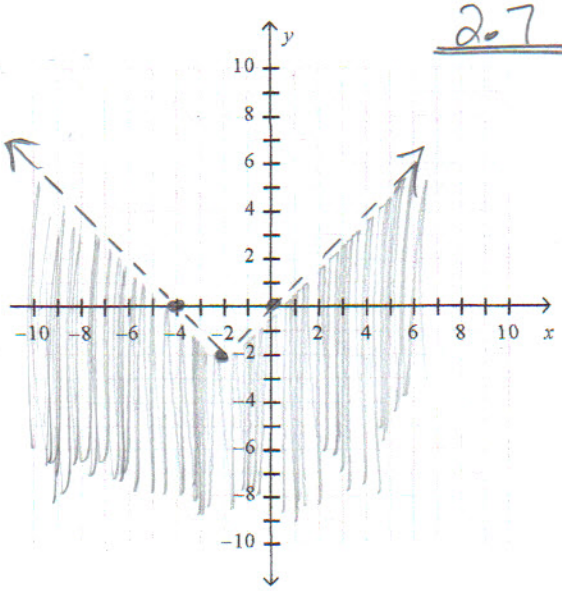
$y <$ $y \leq$ Shade below down

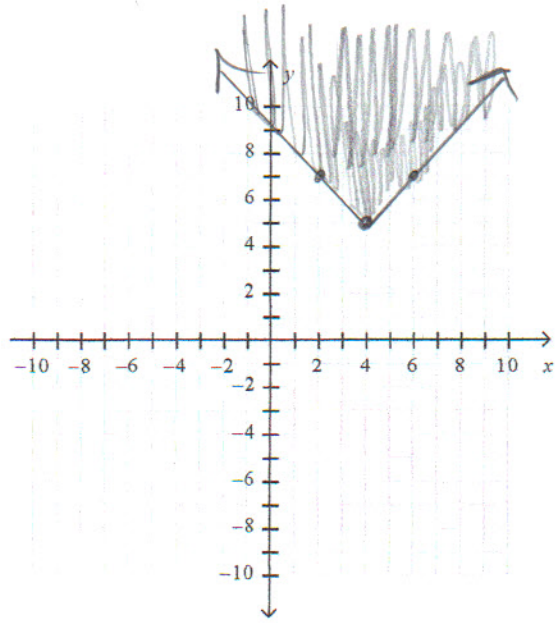
$y >$ or $y \geq$ Shade above

dashed line Shade down

	-4	-2	0
	0	-2	0

do 5 points



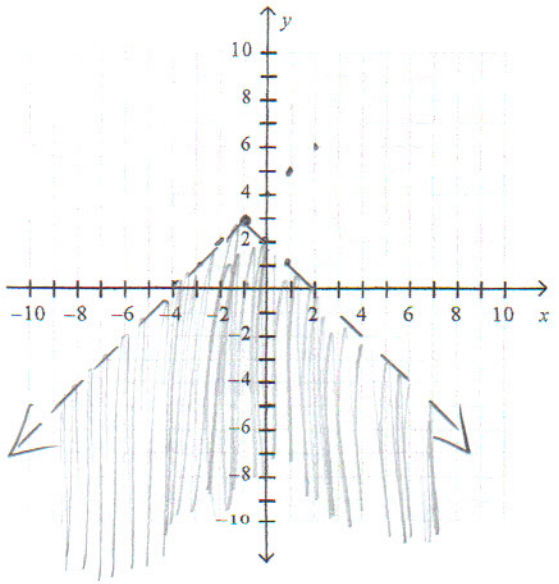


$y \geq |x-4| + 5$

$(4, 5)$ solid

Shade above

x	2	4	6
y	7	5	7



$-y + 3 > |x+1| - 3$

$-3 \quad -3$

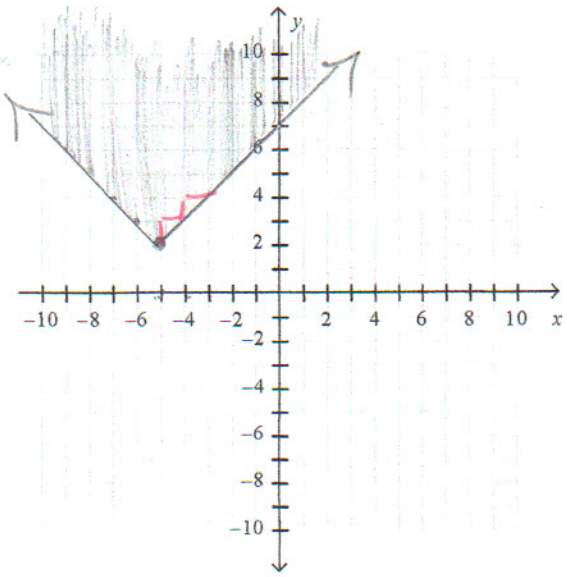
$(-1)\ -y > -1\left[|x+1| - 3\right]$

$y < -|x+1| + 3$

$(-1, 3)$

dash

Shade below

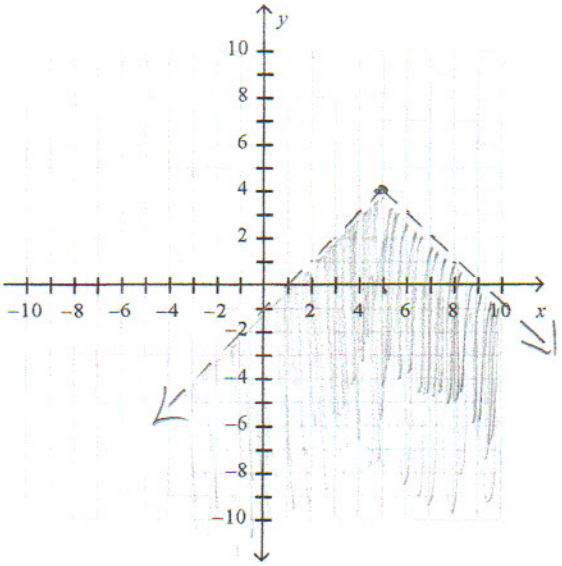


What is the equation?

vertex? (-5, 2) slope? a = 1 shaded above / below

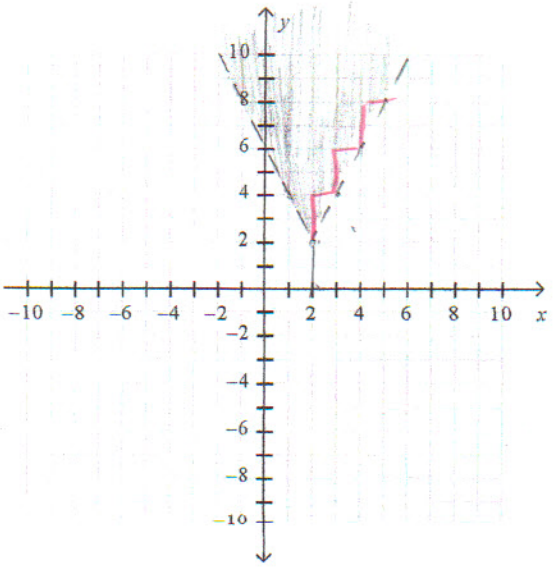
dash / solid

$y \geq |x+5|+2$



(5, 4) dashed shade down

$y < |x-5|+4$



$a = 2$

dash shade up

(2, 2)

$y > 2|x-2|+2$