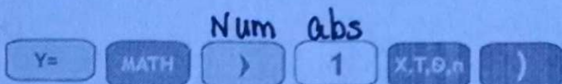
Exploration of Absolute Value Functions

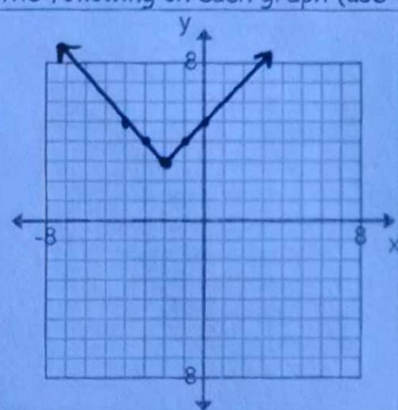
<table>
<tr><td colspan="4" align="center">$$f(x) = a|x - h| + k$$</td></tr>
<tr><td rowspan="2">a</td><td rowspan="2">changes width
a > 1 → Vertical Stretch (narrows)
"stretches" towards y-axis
0 < a < 1 → Vertical compression (wider)
"compressed" away from y-axis
Opens Up / Down
a > 0 → OPENS UP ∨
a < 0 → OPENS DOWN ∧</td><td>h</td><td>Horizontal Translation
|x − h| → moves RIGHT
|x + h| → moves LEFT</td></tr>
<tr><td>k</td><td>Vertical Translation
|x| + k → moves up
|x| − k → moves down</td></tr>
</table>



ACURATELY graph the following on each graph (use table to plot points and connect)

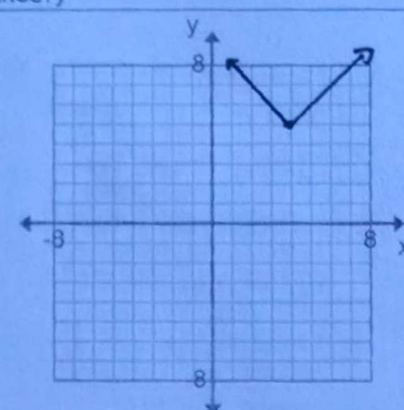
$y = |x + 2| - 3$

vertex (-2,3)



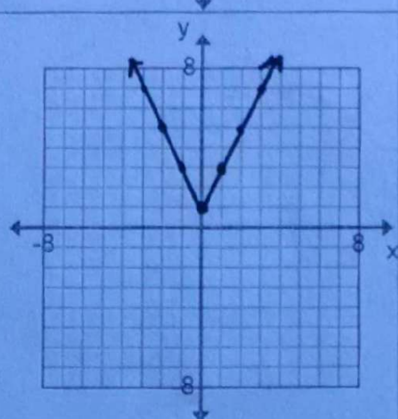
$y = |x - 4| + 5$

Vertex: (4,+5)



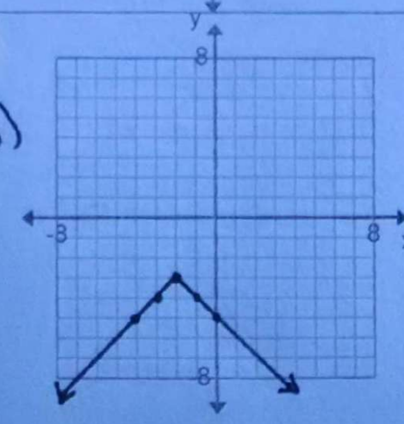
$y = 2|x| + 1$

Vertex: (0,1)



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

Vertex: (-2,-3)

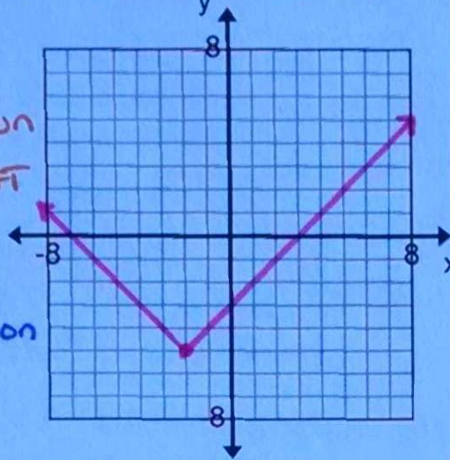


Graph the following WITHOUT the graphing calculator.

a. $y = |x+2| - 5$ Vertex: $(-2, -5)$

Horizontal Translation 2 units LEFT

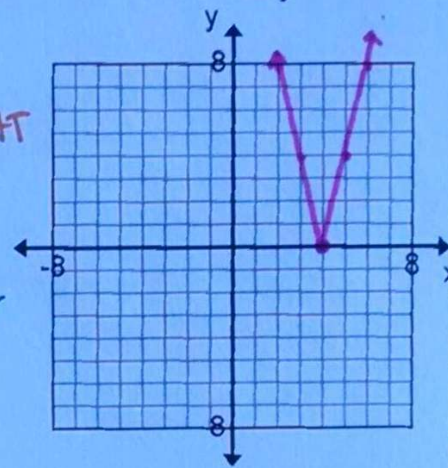
Vertical Translation 5 units down



b. $y = 3|x-4|$ Vertex: $(4, 0)$

4 units RIGHT

Vertical stretch by a factor of 4



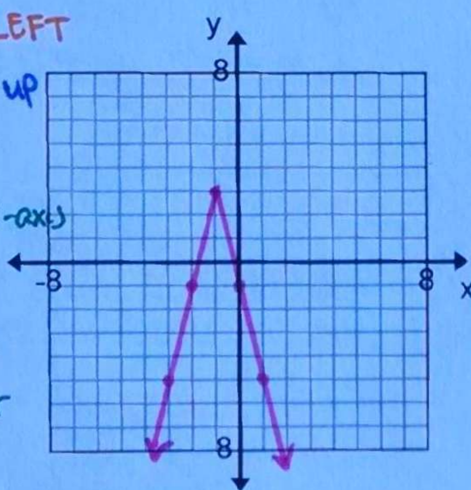
c. $y = -4|x+1| + 3$ Vertex: $(-1, 3)$

1 unit LEFT

3 units up

Reflect across X-axis

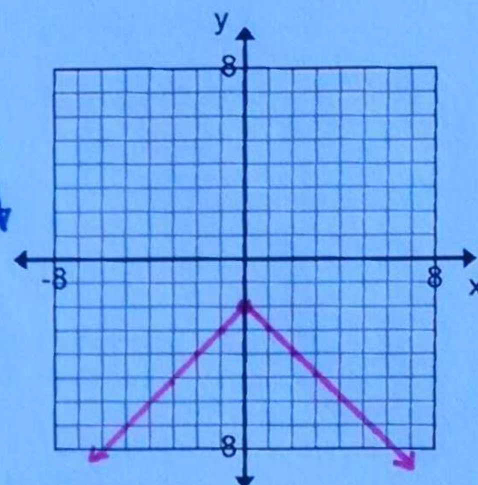
Vertical stretch by factor of 4



d. $y = -|x| - 2$ Vertex: $(0, -2)$

Reflect across X-axis

2 units ↓



Example 2: Let $g(x)$ be the indicated transformation of $f(x)$. Write the rule for $g(x)$.

a. $f(x) = \|x\|$ translated down 3 k units and right 4 units h $g(x) = \|x - h\| + k$	b. $f(x) = \|x\|$ the vertex is $(-4, -5)$ h k $g(x) = \|x+4\| - 5$	c. $f(x) = \|x\| + 2$ reflected across the x-axis $-a$ $g(x) = -\|x\| + 2$
d. $f(x) = \|x-2\|$ stretched vertically by a factor of 2 a $g(x) = 2\|x-2\|$	e. $f(x) = \|x\| + 1$ compressed vertically by a factor of $\frac{1}{3}$ a $g(x) = \frac{1}{3}\|x\| + 1$	f. $f(x) = 5\|x+3\|$ reflected across the x-axis and translated 4 units down k $g(x) = -5\|x+3\| - 4$

GLUE HERE