

Key

**Absolute Value Functions – Quadratics!**

1. Write the following functions as piecewise functions:

a.  $y = |x^2 - 16|$   
 $y = x^2 - 16$  when  $x^2 - 16 \geq 0$   
 $(x+4)(x-4) \geq 0$

$y = x^2 - 16$  when  $x \leq -4, x \geq 4$   
 $y = -x^2 + 16$  when  $x^2 - 16 \leq 0$   
 $(x+4)(x-4) \leq 0$   
 $y = -x^2 + 16$  when  $-4 \leq x \leq 4$

b.  $f(x) = |x^2 - 81|$   
 $y = x^2 - 81$  when  $x^2 - 81 \geq 0$   
 $(x+9)(x-9) \geq 0$

$y = x^2 - 81$  when  $x \leq -9, x \geq 9$   
 $y = -x^2 + 81$  when  $x^2 - 81 \leq 0$   
 $(x+9)(x-9) \leq 0$   
 $y = -x^2 + 81$  when  $-9 \leq x \leq 9$

c.  $y = |x^2 - 5x - 24|$   
 $y = x^2 - 5x - 24$  when  $x^2 - 5x - 24 \geq 0$   
 $(x-8)(x+3) \geq 0$

$y = x^2 - 5x - 24$  when  $x \leq -3, x \geq 8$   
 $-x^2 + 5x + 24$  when  $x^2 - 5x - 24 \leq 0$   
 $(x-8)(x+3) \leq 0$   
 $y = -x^2 + 5x + 24$  when  $-3 \leq x \leq 8$

d.  $y = |6x^2 - x - 2|$   
 $y = 6x^2 - x - 2$  when  $6x^2 - x - 2 \geq 0$   
 $(3x-2)(2x+1) \geq 0$

$y = 6x^2 - x - 2$  when  $x \leq -\frac{1}{2}, x \geq \frac{2}{3}$   
 $y = -6x^2 + x + 2$  when  $6x^2 - x - 2 \leq 0$   
 $(3x-2)(2x+1) \leq 0$   
 $y = -6x^2 + x + 2$  when  $-\frac{1}{2} \leq x \leq \frac{2}{3}$

2. Given  $f(x)$  in a-d, graph  $|f(x)|$  (use grids on back side of page):

a.  $f(x) = x^2 - 4$

Graph  $y = |x^2 - 4|$

$V = (0, -4)$

then graph  $y = x^2$  fr. vertex

\* then REFLECT about x-axis

b.  $f(x) = -x^2 + 1$

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

$V = (0, 1)$

then graph  $y = -x^2$  fr. vertex

\* Then REFLECT about x-axis

c.  $f(x) = (x-3)^2 - 1$

Graph  $y = |(x-3)^2 - 1|$

$V = (3, -1)$  then graph  $y = x^2$  fr. vertex

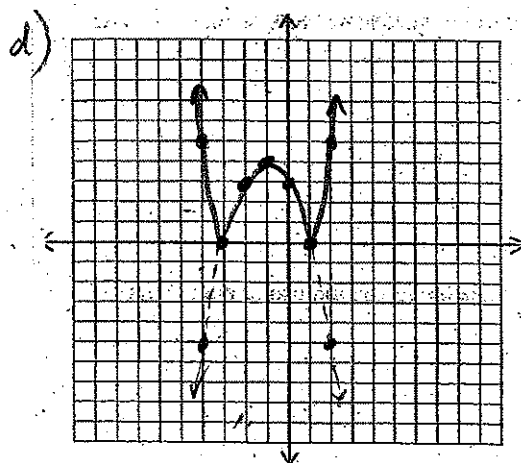
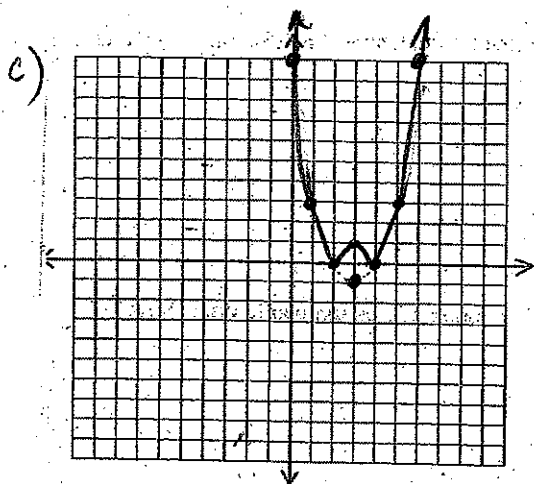
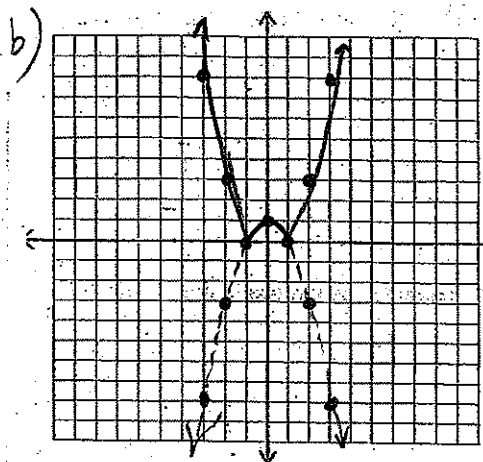
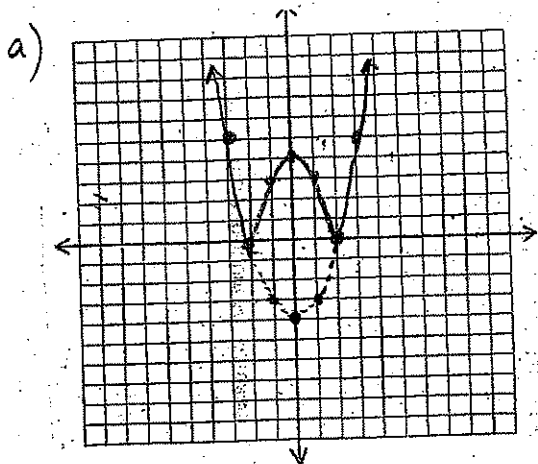
\* then reflect about x-axis

d.  $f(x) = -(x+1)^2 + 4$

Graph  $y = |-(x+1)^2 + 4|$

$V = (-1, 4)$  then graph  $y = -x^2$  fr. vertex

then REFLECT about x-axis.



a) PIECEWISE

$$y = x^2 - 4 \text{ when } x^2 - 4 \geq 0$$

$$(x+2)(x-2) \geq 0$$

$$x \leq -2, x \geq 2$$

$$y = -x^2 + 4 \text{ when } -2 \leq x \leq 2$$

c) PIECEWISE

$$y = (x-3)^2 - 1 \text{ when } (x-3)^2 - 1 \geq 0$$

$$x^2 - 6x + 8 \geq 0$$

$$(x-4)(x-2) \geq 0$$

$$\text{when } x \leq 2, x \geq 4$$

$$y = -(x-3)^2 - 1 \text{ when } 2 \leq x \leq 4$$

b) PIECEWISE

$$y = -x^2 + 1 \text{ when } -x^2 + 1 \geq 0$$

$$(x+1)(-x+1) \geq 0$$

$$-1 \leq x \leq 1$$

$$y = x^2 - 1 \text{ when } -x^2 + 1 \leq 0$$

$$(x+1)(-x+1) \geq 0$$

$$x \leq -1, x \geq 1$$

d) PIECEWISE

$$y = -(x+1)^2 + 4 \text{ when } -(x+1)^2 + 4 \geq 0$$

$$-x^2 - 2x + 3 \geq 0$$

$$x^2 + 2x - 3 \leq 0$$

$$(x+3)(x-1) \leq 0$$

$$\text{when } -3 \leq x \leq 1$$

$$y = (x+1)^2 + 4 \text{ when } x \leq -3, x \geq 1$$