

Graphing Quadratics Notes

Please read both Factoring 1 & 2 and CTS 1 & 2 before these notes.

Factoring & CTS are 2 techniques we have for rewriting quadratics. FOIL, or the distributive property, is how we reverse the process.

Each form of the quadratic tells you something about the graph.

Standard Form
 $y = ax^2 + bx + c$

Tells you the y-intercept is $(0, c)$

Factored Form
 $y = a(x - z_1)(x - z_2)$

Tells you the x-intercepts are $(z_1, 0)$ & $(z_2, 0)$

Notice it is $(x - z_1)$ as a factor, but $x = z_1$ as an x-intercept.

Graphing Form
or
CTS Form
or
Vertex Form

$$y = a(x - h)^2 + k$$

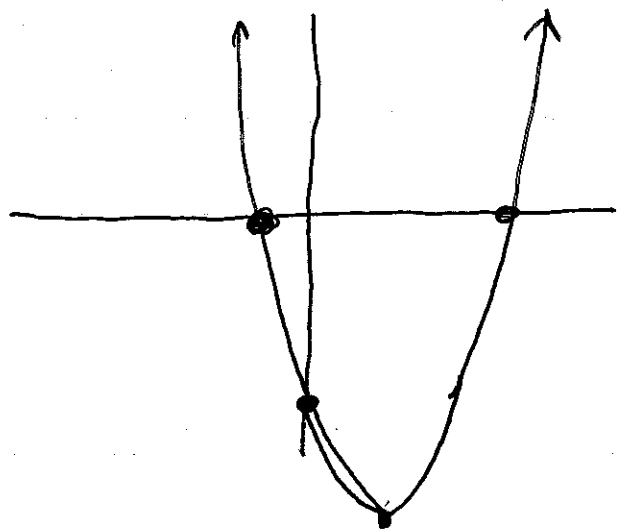
Tells you the vertex is (h, k)
Notice it is $(x - h)^2$ but $x = h$ is the vertex.

Also notice that "a" is the same for any form. "a" stretches your parabola vertically. If $a < 0$, the parabola flips over.

Ex 1 $y = x^2 - 3x - 4 \rightarrow y\text{-int} = (0, -4)$

Factor $y = (x-4)(x+1) \rightarrow x\text{-ints} = (4, 0)$
 $(-1, 0)$

CTS $y = (x-1.5)^2 - 6.25 \rightarrow \text{vertex} = (1.5, -6.25)$

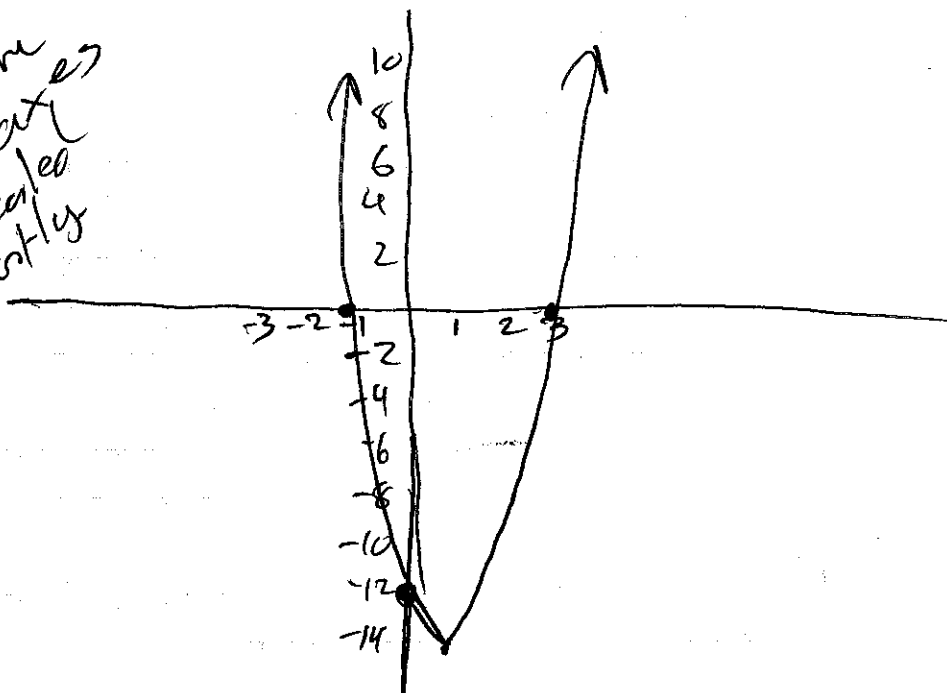


Ex 2 $y = 3x^2 - 5x - 12 \rightarrow y\text{-int} = (0, -12)$

Factor $y = (3x+4)(x-3) \rightarrow x\text{-ints} = (-4/3, 0)$
 $(3, 0)$

CTS $y = 3(x - 5/6)^2 - 25/12 - 12 \rightarrow \text{vertex} = (5/6, -14 1/2)$

Notice the
x & y axes
are scaled
differently

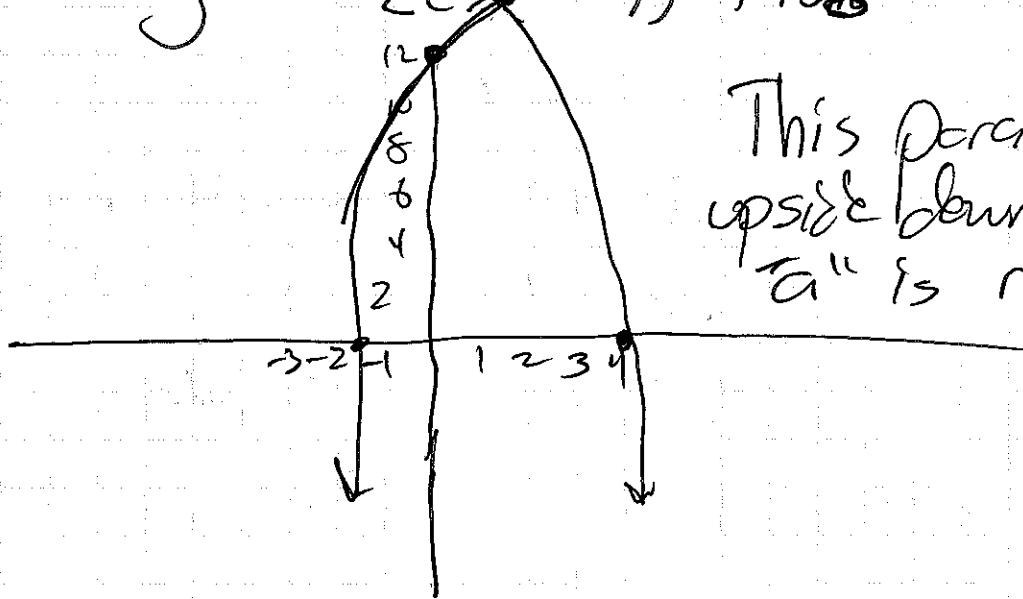


Ex 3

$$y = -2x^2 + 5x + 12 \rightarrow y\text{-int} = 12$$

$$y = (-2x - 3)(x - 4) \rightarrow x\text{-ints} = \left(-\frac{3}{2}, 0\right) \\ (4, 0)$$

$$y = -2\left(x - \frac{5}{4}\right)^2 + 15\frac{1}{8} \rightarrow \text{vertex} = \left(\frac{5}{4}, 15\frac{1}{8}\right)$$



This parabola is upside down because "a" is negative.

Ex 4

$$y = -16(x - 2)^2 + 48 \rightarrow \text{vertex} = (2, 48)$$

$$y = -16(x - 2)(x - 2) + 48$$

$$y = -16(x^2 - 4x + 4) + 48$$

$$y = -16x^2 + 64x - 64 + 48$$

$$y = -16x^2 + 64x - 16 \rightarrow y\text{-int} = (0, -16)$$

$$y = -16(x^2 - 4x + 1)$$

Can't be factored... Other way to get x-intercepts is with SADMEP



$$-16(x-2)^2 + 48 = 0$$

$$-16(x-2)^2 = -48$$

$$\frac{-48}{-16}$$

$$(x-2)^2 = 3$$

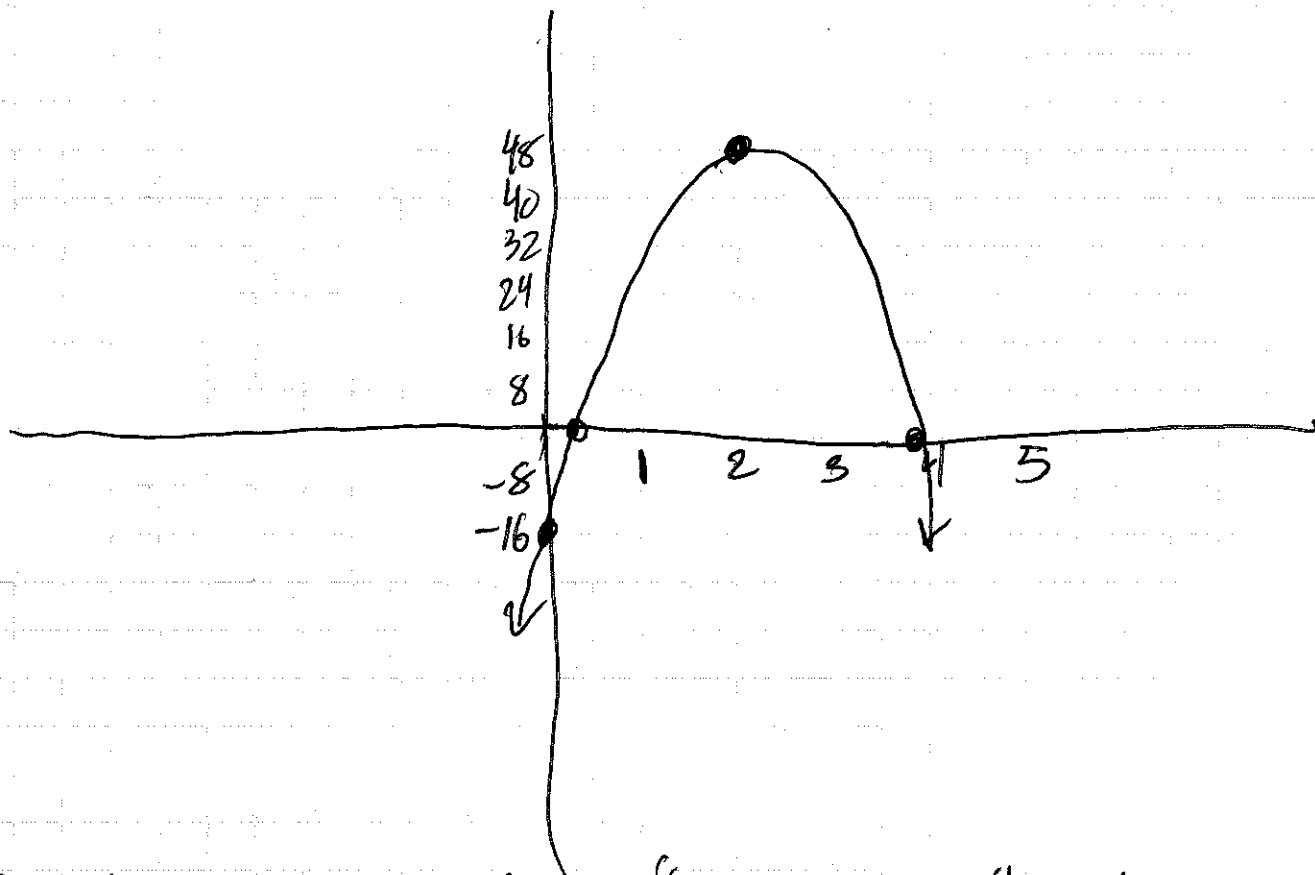
$$x-2 = \pm\sqrt{3}$$

$$x = \sqrt{3} + 2 \quad x = -\sqrt{3} + 2$$

$$x \approx 1.73 + 2 \quad x \approx -1.73 + 2$$

$$x \approx 3.73 \quad x \approx .268$$

x-intercepts $(3.73, 0)$ $(.268, 0)$



PS: The $a = -16$ describes gravity. A projectile flying through the air will have a $-16x^2$ term if you measure in feet per second.