

2.5 Graphing Quadratics

Graphing from vertex form $y = a(x-h)^2 + k$

- Change to vertex form by completing the square
- START at the vertex (h,k)
- find if parabola opens UP or DOWN If the parabola opens up "a" is positive.
If the parabola opens down "a" is negative.
- determine the stretch/compression factor "a" and use the pattern to count to the next point

Counting stretch:

Basic parabola	Stretch
→ 1	↑ 1 × a
→ 2	↑ 4 × a
→ 3	↑ 9 × a

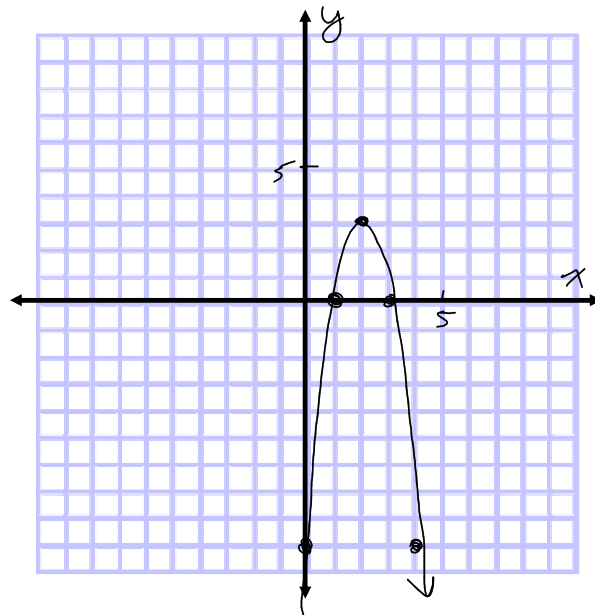
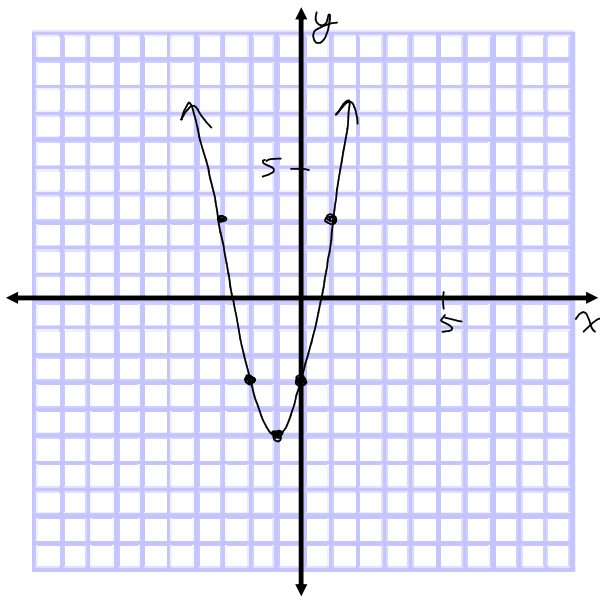
Ex: Completing the Square and graph:

a) $y = 2x^2 + 4x - 3$
 $= 2(x^2 + 2x + 1 - 1) - 3$
 $= 2(x^2 + 2x + 1) - 2 - 3$
 $= 2(x + 1)^2 - 5$

Vertex $(-1, -5)$

b) $y = -3x^2 + 12x - 9$
 $y = -3(x^2 - 4x + 4 - 4) - 9$
 $= -3(x^2 - 4x + 4) + 12 - 9$
 $= -3(x - 2)^2 + 3$

Vertex $(2, 3)$



Graphing from Factored Form $y = a(x-s)(x-t)$

- Factor and find zeros
- Plot zeros
- find x of vertex halfway between zeros
- find y of vertex then plot vertex
- find and plot two more symmetrical points

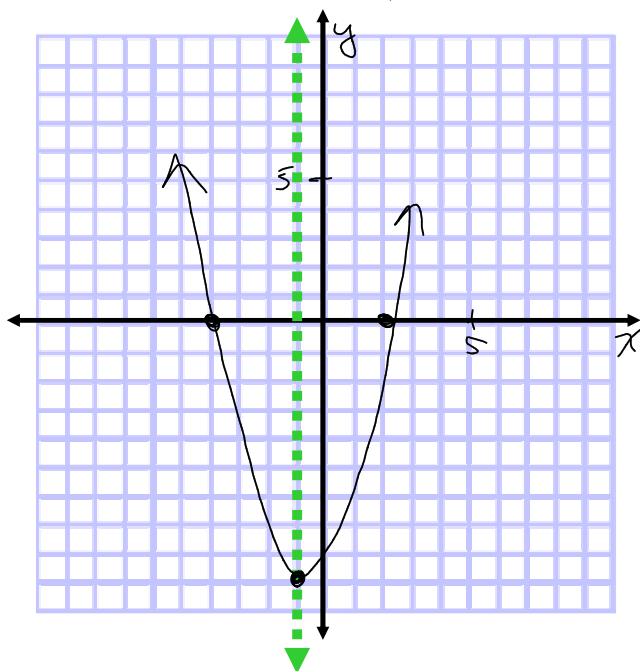
The axis of symmetry is a line that divides the parabola in half, symmetrically. The x-coordinate of the vertex is always the axis of symmetry.

a) Graph from factored form

$$y = x^2 + 2x - 8$$

$$= (x - 2)(x + 4)$$

$x = 2$ $x = -4$



Axis of Symmetry

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

$$= -1$$

Sub in $x = -1$

$$y = (-1 - 2)(-1 + 4)$$

$$= -3(3)$$

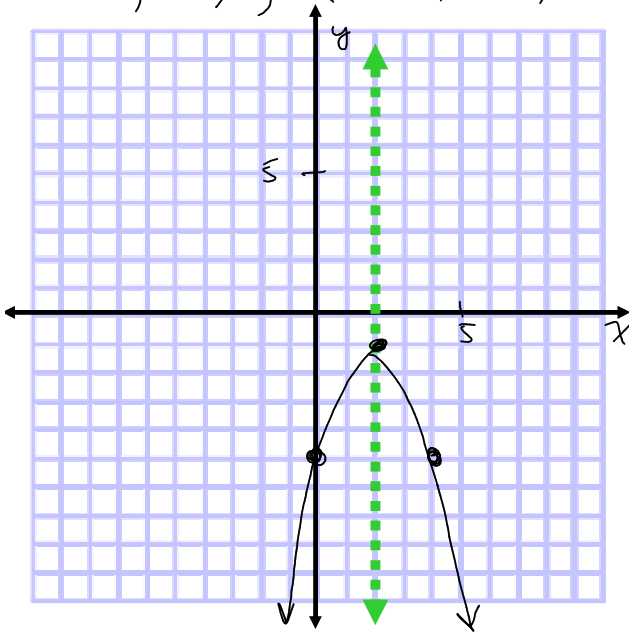
$$= -9$$

Graphing from Partial Factored form $y = ax(x-s) + t$

- partial factor
- find and plot two symmetrical points
- find and plot vertex (halfway between symm pts)

Ex Graph by partial factoring

a) $y = -x^2 + 4x - 5$
 $= -x(x-4) - 5$
 $(0, -5), (4, -5)$



Axis of symmetry

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

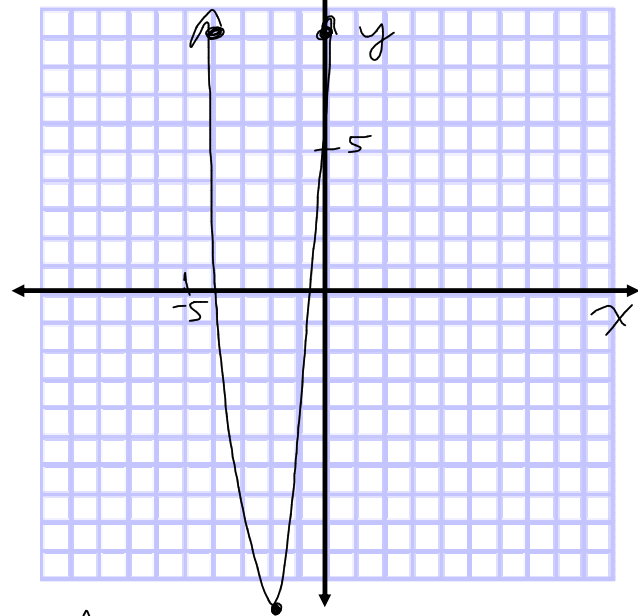
$$= 2$$

$$y = -(2)^2 + 4(2) - 5$$

$$= -4 + 8$$

$$= 4$$

b) $y = 5x^2 + 20x + 9$
 $y = 5x(x+4) + 9$
 $(0, 9), (-4, 9)$



A.O.S.

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

$$= -2$$

Sub in $x = -2$

$$y = 5(-2)(-2+4) + 9$$

$$y = -10(2) + 9$$

$$= -11$$

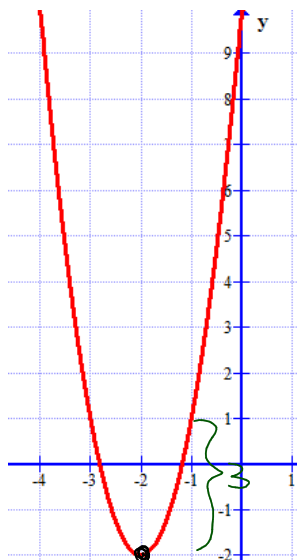
$$V(-2, -11)$$

Finding an Equation

Ex 1 Express the equation of the following parabolas in **vertex form**.

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

a)

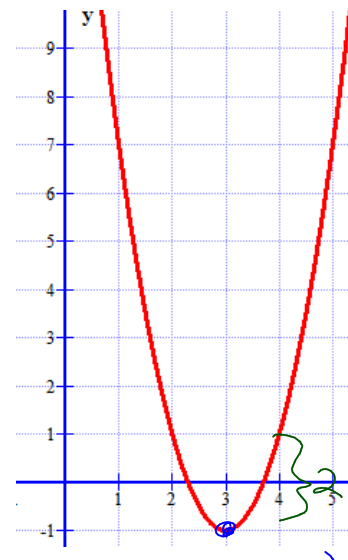


Vertex

$$a = 3$$

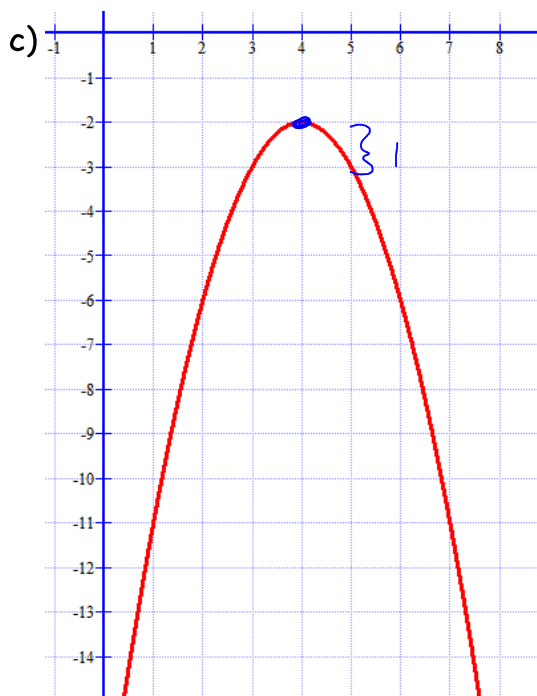
$$\therefore y = 3(x + 2)^2 - 2$$

b)



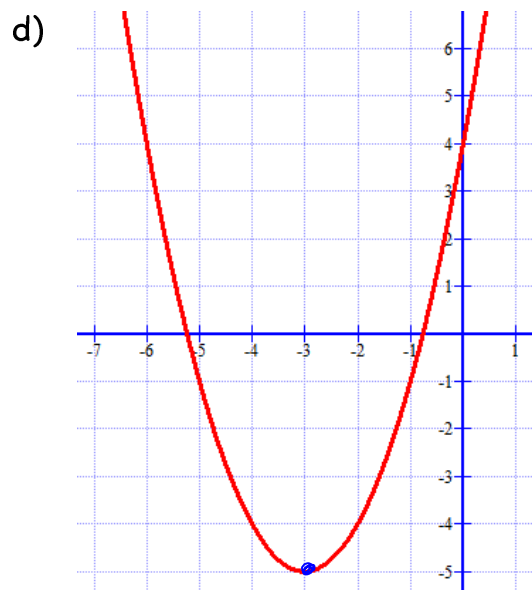
$$a = 2$$

$$\therefore y = 2(x - 3)^2 - 1$$



$$V(4, -2)$$
$$a = -1$$

$$y = -(x - 4)^2 - 2$$



$$(-3, -5)$$

$$a = 1$$

$$\therefore y = (x + 3)^2 - 5$$

Can't count the stretch....What do I do???

Ex 1

Find an equation of the parabola that has a vertex of (3, -2) and has an x intercept of 5

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

↑
how to find?

$$0 = a(5-3)^2 - 2$$

$$2 = a(4)$$

$$a = \frac{1}{2}$$

Use the intercept! (5,0)

$$\therefore y = \frac{1}{2}(x-3)^2 - 2$$

Ex 2

Find an equation, in standard form, of the parabola that has zeros at 5 and -1 and passes through the point (1, -4)

↳ Use factored form

$$y = a(x-r)(x-s)$$

$$y = a(x-5)(x+1)$$

$$y = \frac{1}{2}(x-5)(x+1)$$

$$= \frac{1}{2}(x^2 - 4x - 5)$$

$$= \frac{1}{2}x^2 - 2x - \frac{5}{2}$$

Sub in (1, -4)

$$-4 = a(1-5)(1+1)$$

$$-4 = a(-4)(2)$$

$$\frac{1}{2} = a$$

$$\therefore y = \frac{1}{2}x^2 - 2x - \frac{5}{2}$$

Ex 3

Find an equation, in standard form, of the parabola that has zeros at $\sqrt{5}$ and $-\sqrt{5}$ and passes through the point (3, -4)

$$y = a(x+\sqrt{5})(x-\sqrt{5})$$

Sub in (3, -4)

$$-4 = a(3+\sqrt{5})(3-\sqrt{5})$$

$$-4 = a(9-5)$$

$$-4 = a(4)$$

$$-1 = a$$

$$\therefore y = -(x+\sqrt{5})(x-\sqrt{5})$$

$$= -(x^2 - 5)$$

$$= -x^2 + 5$$

$$\therefore y = -x^2 + 5$$

HOMWORK

2.5 Handout (standard to factored form, partial factored form
vertex form, graph)

AND

#13 from Homework handout 2.6