

Modelling Quadratics Using Vertex Form

Nov. 15/2011

- 1) Sketch the parabola, if possible
- 2) Identify the key properties
- 3) Sub vertex (h, k) into $y = a(x - h)^2 + k$
- if vertex is not given, use symmetry
- 4) Sub any other unused point to find a
- 5) Does your answer make sense?

Apr 18-3:11 PM

Ex. 1. Determine the equation in vertex form.

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

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

sub $(0, 5)$

$$5 = a(0 - 2)^2 + 1$$

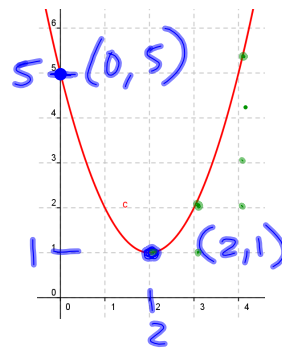
$$5 = a(4) + 1$$

$$-1 \quad -1$$

$$\frac{4}{4} = \frac{4a}{4}$$

$$\boxed{a = 1}$$

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



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Ex.2 State the equation of the parabola obtained by applying these transformations to the graph of $y = x^2$.

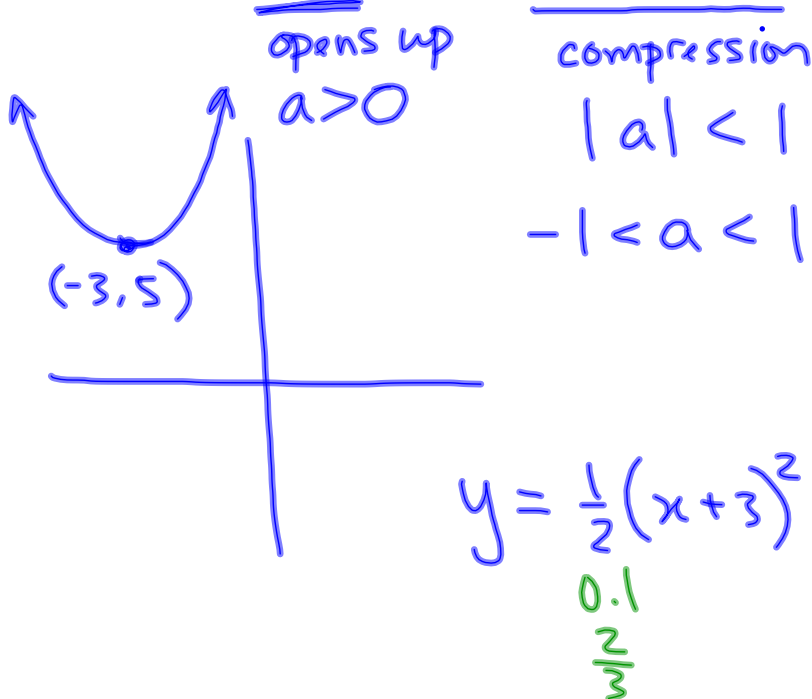
- a vertical stretch by a factor of 5 $a = 5$
- a vertical shift of 9 units $k = 9$

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

$$y = 5x^2 + 9$$

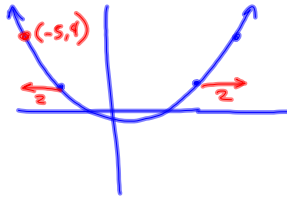
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Ex.3 Write an equation for the parabola that has a vertex at $(-3, 5)$, no zeros, and is wider than $y = x^2$.



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Ex.4 Find the equation of the quadratic that passes through the points $(-3, 2)$, $(5, 2)$ and $(7, 4)$.



Axis of Symmetry: $x = \frac{-3+5}{2}$
 $x = 1 \rightarrow h = 1$

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

$$y = a(x-1)^2 + k$$

Sub $(-3, 2)$

$$2 = a(-3-1)^2 + k$$

$$2 = a(-4)^2 + k$$

$$2 = 16a + k$$

Sub $(5, 2)$

$$2 = a(5-1)^2 + k$$

$$2 = a(4)^2 + k$$

$$2 = 16a + k \quad \longleftrightarrow \quad 2 = 16a + k \quad \textcircled{1}$$

Same equation!

Sub $(7, 4)$

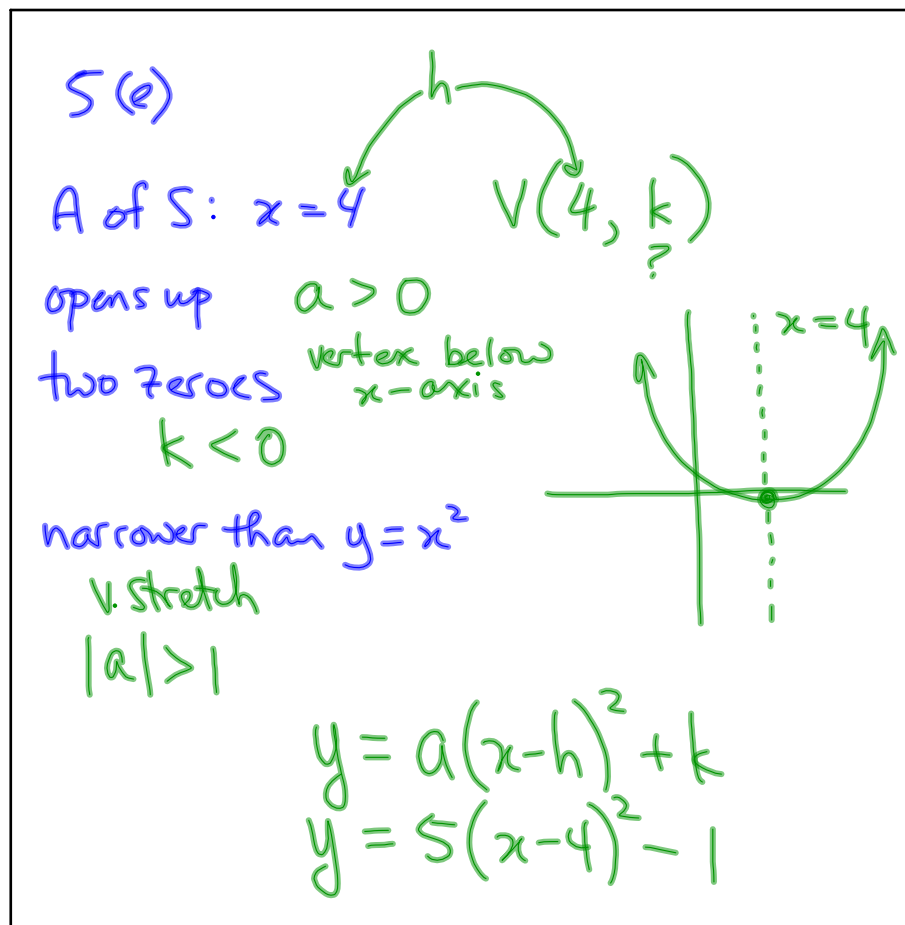
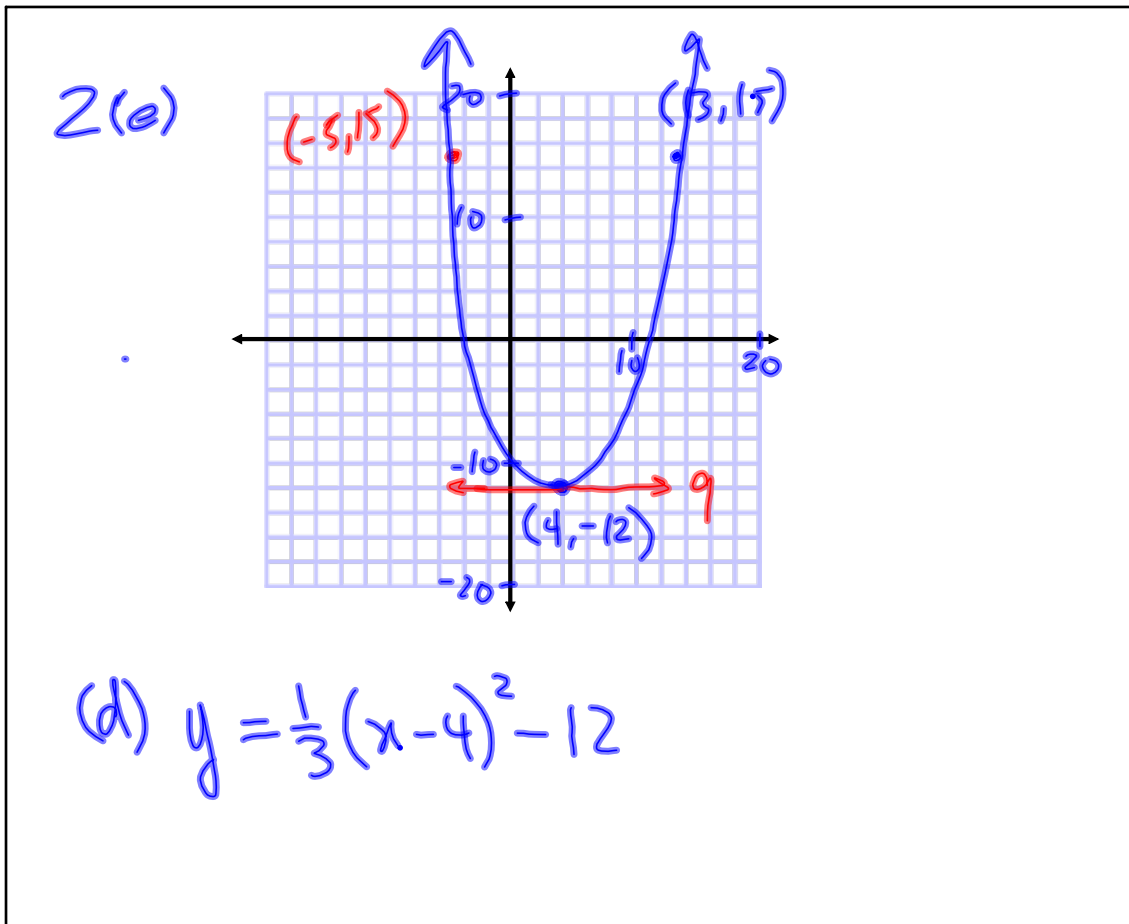
$$4 = a(7-1)^2 + k$$

Solve!
H/W!

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Assigned Work:

p. 280 # 1, 2ace, 3ace, 4, 5ace, 6cd,
 7, 8 (w/ diagram), 10, 16



6(c) $V(-2, -3)$ $P(-5, 6)$
 h k

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

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

$$y = \underline{a}(x+2)^2 - 3$$

sub $(-5, 6)$

$$6 = a(-5+2)^2 - 3$$

$$6 = 9a - 3$$

$$\begin{matrix} +3 & & +3 \\ 9 = 9a \end{matrix}$$

$$\boxed{a=1} \rightarrow y = (x+2)^2 - 3$$

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7.(b) A q S: $x = \frac{1+2}{2}$
 $= \frac{3}{2}$
 $= 1.5$

x	y
0	12
1	4
2	4
3	12
4	28

or
 $x = \frac{0+3}{2}$
 $= 1.5$

$$y = a(x-1.5)^2 + k$$

not y-int!!

Sub $(0, 12)$ $\left\{ \begin{array}{l} \text{sub } (1, 4) \\ \text{sub } (2, 4) \end{array} \right.$

$$12 = a(0-1.5)^2 + k$$

$$12 = 2.25a + k \text{ ①}$$

$$4 = a(1-1.5)^2 + k$$

$$4 = 0.25a + k \text{ ②}$$

①: $12 = 2.25a + k$
 ②: $4 = 0.25a + k$

①-②: $8 = 2a$
 $\boxed{a=4}$

Sub $a=4$ into ②

$$4 = 0.25(4) + k$$

$$4 = 1 + k$$

$$\boxed{k=3}$$

$\therefore y = 4(x-1.5)^2 + 3$

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8.

$V(3, 2)$

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

sub $(0, 0)$

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

$$0 = 9a + 2$$

$$-2 = 9a$$

$$-\frac{2}{9} = a \quad y = -\frac{2}{9}(x - 3)^2 + 2$$

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10.

0	0.5	1	1.5	2	2.5	3
5	11.25	15	16.25	15	11.25	5
	6.75	3.75	1.25	-1.75	-3.75	-6.75
		-2.5	-2.5	-2.5		

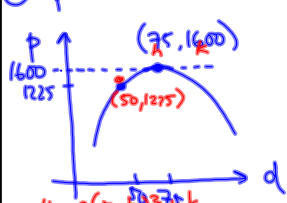
$V(1.5, 16.25)$

(d) $y = a(x - 1.5)^2 + 16.25$

(e) sub $x = 2.75$ into equation

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① catch up on past work
 ② p. 284 #15



$y = a(x-h)^2 + k$
 $y = a(x-75)^2 + 1600$
 Sub (50, 1225)
 $1225 = a(50-75)^2 + 1600$
 $1225 = 625a + 1600$
 $-1600 \quad -1600$
 $-375 = 625a$
 $\frac{-375}{625} = \frac{625a}{625}$
 $-\frac{3}{5} = a$
 $a = -0.6$
 $y = -0.6(x-75)^2 + 1600$
 $p = -0.6(d-75)^2 + 1600$ ©

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