

Recall:

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

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

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

Today we will determine equations for different quadratics.

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### Modelling Quadratic Equations

Apr. 19/2011

Steps:

- 1) Sketch the parabola, if possible.
- 2) Identify the key properties given.
- 3) Select the form of the equation based on the key properties.
- 4) Substitute the given information or use given points along with substitution and/or elimination to solve for any missing values.

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Ex: 1) Determine the equation of the graph shown on the right.

(a)

In vertex form...

$$V(2, 1)$$

$$y\text{-int} = 5$$

step pattern: 1, 3, 5, ...

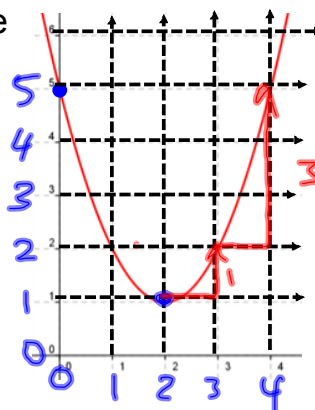
→ same as parent function

$$\rightarrow a = 1.$$

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

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

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



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Ex: 1) Determine the equation of the graph shown on the right.

(b)

In standard form...

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

$$a = 1 \text{ (step pattern)}$$

$$c = 5 \text{ (y-int)}$$

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

$$\text{Sub vertex } (2, 1)$$

$$(1) = (2)^2 + b(2) + 5$$

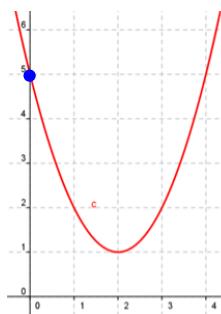
$$1 = 4 + 2b + 5$$

$$1 - 9 = 2b$$

$$-8 = 2b$$

$$\boxed{b = -4}$$

$$y = x^2 - 4x + 5$$



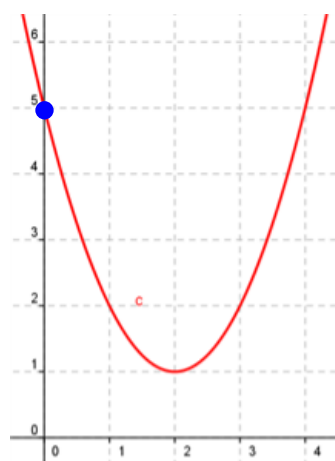
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Ex: 1) Determine the equation of the graph shown on the right.

(c)

In factored form...

parabola has no zeros  
→ cannot be factored



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Ex. 2) State the equation of the parabola obtained by applying a vertical stretch by a factor of 5, along with a vertical shift of 9 units <sup>up</sup> to the graph of  $y = x^2$ .

stretch by 5 →  $a = 5$

step pattern: 1, 3, 5, 7... → 5, 15, 25, 35, ...

shift up 9 :  $k = 9$

assume  $h = 0$  (no shift left/right)

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

$$y = 5(x-0)^2 + 9$$

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

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

does not cross  
x-axis

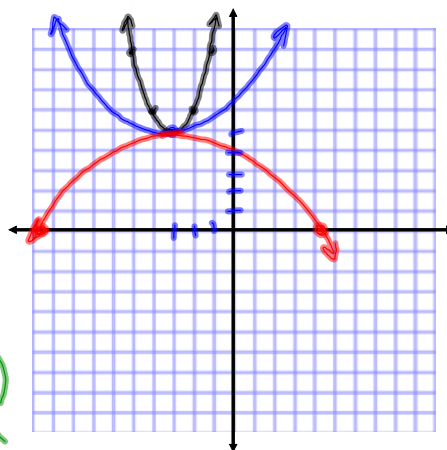
$$y = a(x-h)^2 + k$$

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

$a$  is positive ( $a > 0$ )  
parabola is compressed  
( $a < 1$ )

let  $a = 0.5$

$$y = \frac{1}{2}(x+3)^2 + 5$$



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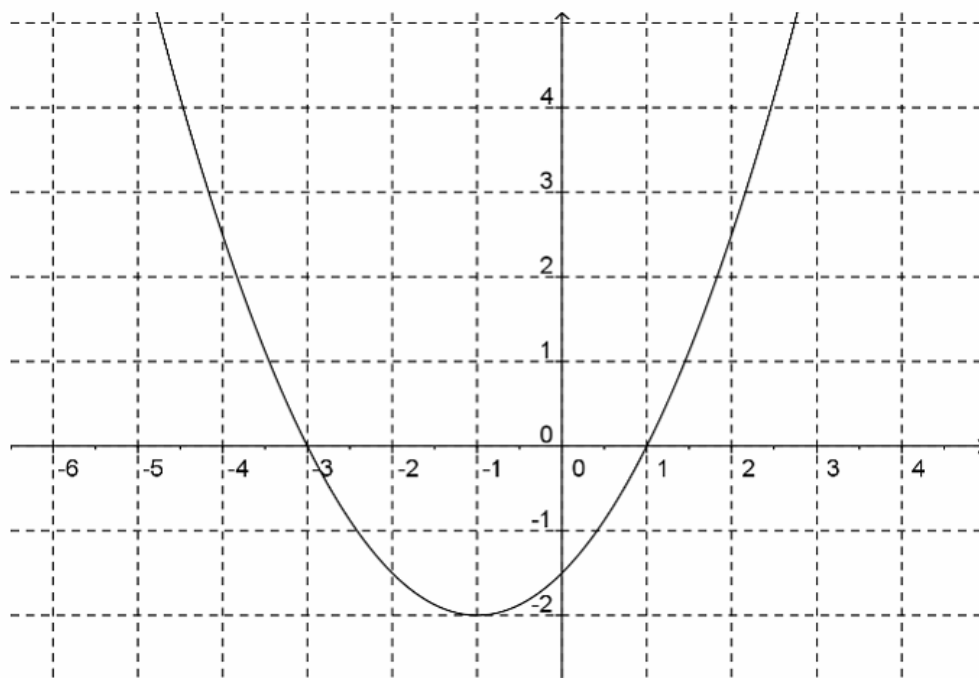
Ex. 4) Find the equation, in factored form, of the quadratic that passes through the points  $(-3, 0)$ ,  $(5, 0)$  and  $(7, 2)$ .

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Ex. 5) Find the equation of the parabola, in factored form, that has only one zero, which is 2, and that passes through the point (5, -2).

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Ex. 6) Determine the equation for the quadratic shown below.



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## Assigned Work:

~~p. 175 #4~~

p. 280-284 #2abc, 3ce, 4abe, 5bdf,  
6cd, 7b, 8

p. 176 #6