

Expand

a)  $(x+7)^2 = (x+7)(x+7) = x^2 + 7x + 7x + 49 = x^2 + 14x + 49$

Factor the following:

a)  $x^2 + 6x + 9$       b)  $x^2 + 10x + 25$

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

Evaluate. Leave answer in exact form

a)  $\frac{5}{2} \div \frac{2}{7}$       b)  $\frac{2}{3} + \frac{8}{7}$

$\frac{5}{2} \times \frac{7}{2} = \frac{35}{4}$        $= \frac{2}{3} + \frac{24}{7}$

What number replaces the ? to make a perfect square?

a)  $x^2 + 12x + 36$       b)  $x^2 - 4x + ?$       c)  $x^2 + ?x + 144$

$= (x+6)^2$

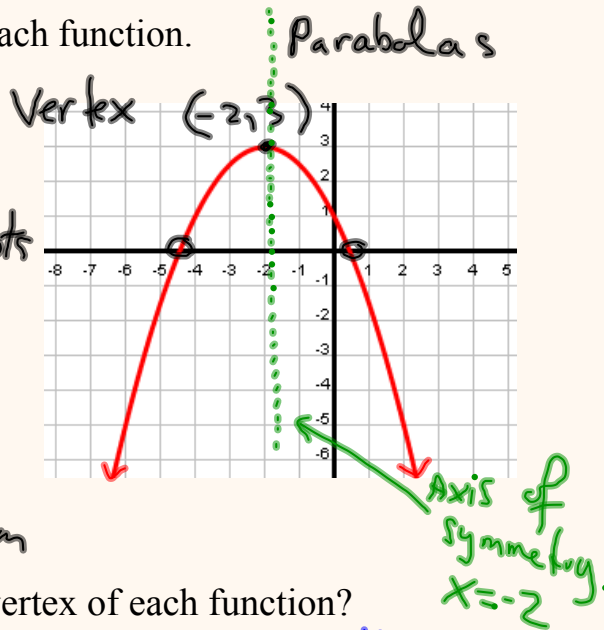
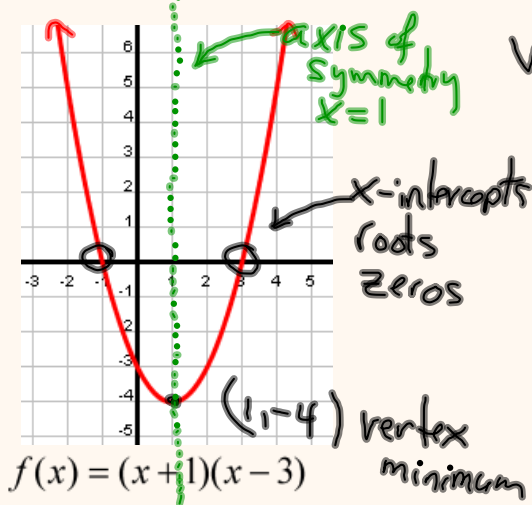
$x^2 - 4x + 4 = (x-2)^2$

$? = 24$   
 $(x+12)^2$

# Maximum or Minimum of a Quadratic Function

# Maximum or Minimum?

Find the maximum or minimum of each function.



How are the zeros related to the vertex of each function?

$$x\text{-value of vertex} = \frac{x_1 + x_2}{2}$$

$x_1, x_2$  are zeros.

## Finding the Vertex - Method 1

Factored form of a parabola helps us determine the x-intercepts of the parabola. This in turn can help us find the vertex.

eg. Determine the vertex of the parabola:

$$f(x) = (x - 1)(x + 5)$$

Zeros:  $x = -5, x = 1$

$$x\text{-coord} = \frac{-5 + 1}{2} = -2$$

plug  $x = -2$  into  $f(x)$

$$f(-2) = (-2 - 1)(-2 + 5) = (-3)(3) = -9$$

The vertex is  $(-2, -9)$

## Method 1 - Example 2

eg. Determine the vertex of the parabola:

$$f(x) = x^2 + 2x - 48$$

Factor it!!

$$f(x) = (x-6)(x+8)$$

Now, Determine the vertex.

$$x=6, x=-8$$

$$x\text{-coord} = \frac{6+(-8)}{2}$$
$$= -1$$

$$f(-1) = (-1-6)(-1+8)$$

$$= (-7)(7)$$

$$= -49$$

$$(-1, -49)$$

## Finding the Vertex - Method 2

Not all quadratics have x-intercepts, so we need another method as well. One such method is called Completing the Square.

eg. Determine the vertex of the parabola:

$$f(x) = x^2 + 6x + 5$$

$$= \underbrace{x^2 + 6x + 9}_{(x+3)^2} - 9 + 5$$

$$= (x+3)^2 - 4$$

$$= (x+3)^2 - 4$$

vertex  $(-3, -4)$

## Method 2 - Examples

eg. Determine the vertex of each parabola.

a)  $f(x) = 2x^2 - 16x - 3$

$$= 2(x^2 - 8x) - 3$$

$$= 2(x^2 - 8x + 16 - 16) - 3$$

$$= 2[(x-4)^2 - 16] - 3$$

$$= 2(x-4)^2 - 32 - 3$$

$$= 2(x-4)^2 - 35$$

b)  
c)

$\rightarrow (4, -35)$

## Homework

Pg. 31 # 1, 2, 7, extra #18

Quiz Tomorrow