**Lesson Plan** 

Lesson: <u>4 - 2</u>

**Grade 10 Academic Math** 

Unit: **Quadratic Relations** 

**Topic: <u>Properties of Quadratic Relations</u>** 

## *homework check:* <u>Principles of Mathematics 10</u> p. 132 # 5, 9 p. 136 # 2, 3, 4, 6

## *note:* <u>Properties of Quadratic Relations</u>

As discussed yesterday, the vertex of a parabola is the highest or lowest point in the curve. Whether this point is the highest or lowest depends on whether the parabola opens up or down. The equation of the line of symmetry occurs at the x value of the vertex. Also recall that Y intercepts occur when the value of x is zero. The y intercept is also the value of C from our equation.

The X intercepts occur when the value of y is zero. In this case, once y has been set to zero, factoring may be necessary to find the x intercepts (also known as roots or zeroes) of the function. The equation of the axis of symmetry can be found by calculating the midpoint between these roots. The maximum or minimum can then be found by substituting this x value into the original equation. For example, for each of the following,

- i) find the y intercept
- ii) find the x intercepts

iii)find the equation of the axis of symmetry

- iv) find the maximum or minimum value of y
- v) write the coordinates of the vertex

a) 
$$y = -2x^2 + 4x$$
 set  $x = 0$  to find the y intercept  
 $y = -2(0)^2 + 4(0)$   
 $y = 0$  The y intercept is  $(0,0)$ 

Factor to find the roots or zeroes or x intercepts

$$y = -2x(x-2)$$
 for x intercepts, set  $y = 0$   
$$-2x = 0$$
  $x - 2 = 0$   
 $x = 0$   $x = 2$ 

The x intercepts are (0,0) and (2,0)

To find the equation of the axis of symmetry, find the midpoint between the roots.

 $\frac{0+2}{2} = 1$ 

x = 1 is the equation of the axis of symmetry

To find the maximum or minimum y value, substitute this value into the original equation  $y = -2x^2 + 4x$  $y = -2(1)^2 + 4(1)$ 

y = 2 which is a maximum because this parabola opens down

The vertex has coordinates (1,2)

b) 
$$y = x^{2} + 4x - 12$$
 set  $x = 0$  to find the y intercept  
 $y = (0)^{2} + 4(0) - 12$   
 $y = -12$  The y intercept is  $(0, -12)$ 

Factor to find the roots or zeroes or x intercepts

 $y = x^{2} + 4x - 12$  y = (x+6)(x-2) for x intercepts, set y = 0 x+6=0 x-2=0x = -6 x = 2

The x intercepts are (-6,0) and (2,0)

To find the equation of the axis of symmetry, find the midpoint between the roots.

$$\frac{-6+2}{2} = -2$$

x = -2 is the equation of the axis of symmetry

To find the maximum or minimum y value, substitute this value into the origial equation

$$y = x^{2} + 4x - 12$$
  
$$y = (-2)^{2} + 4(-2) - 12$$

y = -16 which is a minimum because this parabola opens up

The vertex has coordinates (-2, -16)

## homework assignment: Principles of Mathematics 10 p. 146 #4, 6, 7 c - f, # 8 (without technology), # 12, 13