Warm Up

A ball is hit and follows the path modelled by

$$h = -4.9t^2 + 6t + 0.6$$

How high does the ball reach?

$$-\frac{b}{2a} = \frac{-6}{2(-4.9)}$$

$$= \frac{-6}{-9.8}$$

$$= 0.6122$$

$$h = -4.9(0.6122)^2$$
$$+ 6(0.6122) + 0.6$$

$$h = 2.44m$$

Writing a Quadratic Equation

Lesson objectives

- I know how to write an equation given the zeros and vertex
- I know how to write an equation given the zeros and a point
- I know how to write an equation given the vertex and a point

1.1   Lesson objectives   Teachers' notes   Lesson notes

Nelson Page 192 #s 2, 3, 4b, 5bc, 8 & 12

Families of Quadratics

Quadratics are considered a "family" if they share common characteristics:

1. x-intercepts

2. Vertex

3. y-intercept

Example

1. What characteristics will two parabolas in the family
   $f(x) = a(x - 3)(x + 4)$ share?

Same x-intercepts (no matter what the value of "a" is)

Will all cross the x-axis at $x = 3$ and $x = -4$

Writing the Equation

When we write an equation we use the form for which we have information!

If given the vertex, then use the vertex form

If given the x-intercepts, then use the factored form

Use a point to then solve for "a"!

Example

4. Determine the equation of the parabola with x-intercepts
   a)   −4 and 3, and that passes through (2, 7)

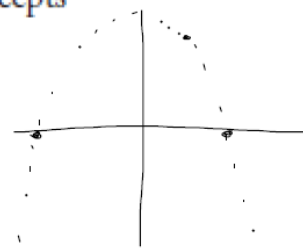Given x-intercepts so
write in factored form

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

$$r = -4, \ s = 3, \ x = 2, \ y = 7$$

"a" should be negative

$$\Rightarrow 7 = a\left(2-(-4)\right)\left(2-(3)\right)$$

$$7 = a(6)(-1)$$

$$\frac{7}{-6} = \frac{-6a}{-6} \quad \Rightarrow a = -\frac{7}{6}$$

$$y = \frac{-7}{6}(x+4)(x-3)$$

Example

5. Determine the equation of the parabola with vertex

   a) $(-2, 5)$ and that passes through $(4, -8)$

write in vertex form

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

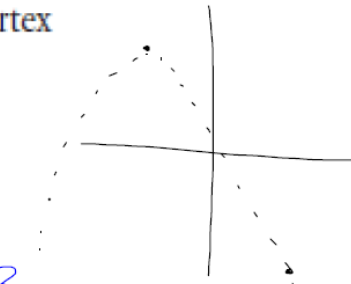$$h = -2, k = 5, x = 4, y = -8$$

$$\Rightarrow -8 = a(4-(-2))^2 + 5$$

$$-8 = a(6)^2 + 5$$

$$\frac{-13}{36} = \frac{36a}{36}$$

$$a = -\frac{13}{36}$$

"a" should be negative

$$y = \frac{-13}{36}(x+2)^2 + 5$$

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11. A projectile is launched off the top of a platform. The table gives the height
    A of the projectile at different times during its flight.

Time (s)	0	1	2	3	4	5	6
Height (m)	11	36	51	56	51	36	11

a) Draw a scatter plot of the data.
b) Draw a curve of good fit.
c) Determine the equation that will model this set of data.

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

$$h = 3, k = 56, x = 0, y = 11$$

$$\Rightarrow 11 = a(0-(3))^2 + 56$$

$$11 = a(-3)^2 + 56$$

$$\frac{-45}{9} = \frac{9a}{9}$$

$$a = -5$$

$$y = -5(x-3)^2 + 56$$