Lesson 3.1.2

Saturday, February 4, 2017   4:39 PM

3.1 (cont.) Investigating Quadratic Functions in Vertex Form

To find the equation of a quadratic function given the vertex and a point, substitute the values

into the formula: $y = a(x-p)^2 + q$

thick/thin
direction of opening
left/right
up/down

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

Example 1: Find an equation of a quadratic function with vertex (1, -2) which passes through (3, -4).

$$y = a(x-1)^2 - 2 \qquad p=1 \quad q=-2$$
$$-4 = a(3-1)^2 - 2$$
$$-4 = a(2)^2 - 2$$
$$-4 = 4a - 2$$
$$-2 = 4a$$
$$a = -0.5 \text{ or } -\tfrac{1}{2}$$
$$\therefore y = -0.5(x-1)^2 - 2$$

Example 2: Find an equation of a quadratic function with vertex (4, -1) that opens down and is congruent to $y = 2x^2$.

means equal to
[*Same shape*
  same size

$$p=4 \quad q=-1 \qquad a = negative$$

$$y = a(x-4)^2 - 1$$

$$y = -2(x-4)^2 - 1$$

You can determine the number of x-intercepts for a quadratic function if you know the location of the vertex and the direction of opening.

Example 3: Determine the number of x-intercepts for each quadratic function without graphing:

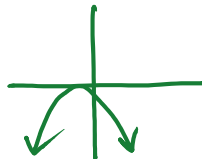a. $f(x) = 0.5x^2 - 7$

opens up   vertex(0,-7)   below x-axis

b. $f(x) = -2(x+1)^2$

opens down   vertex(-1,0)   on x-axis

c. $f(x) = -\dfrac{1}{6}(x-5)^2 - 11$

opens down   vertex(5,-11)   below x-axis

$\therefore 2$ x-intercepts

$\therefore 1$ x-intercept

$\therefore$ No x-intercept
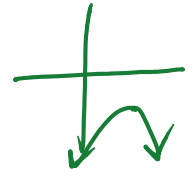
Example 4: A cable that supports a suspension bridge is parabolic. The horizontal distance between the ends of the cable is 140 m. The midpoint of the cable is 14 m below each end of the cable. Determine an equation to model the cable.

$(-70, 14)$

140m

$(70, 14)$

14

14

14

14

$(0, 0)$
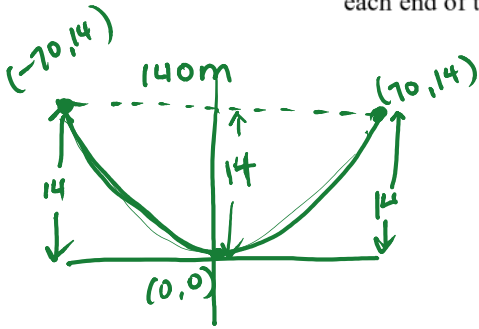
$$y = a(x - p)^2 + q$$

$$y = ax^2$$

$$14 = a(70)^2$$

$$14 = a\,4900$$

$$\frac{14}{4900} = a$$

$$\frac{2}{700} = \frac{1}{350} = a$$

$$y = \frac{1}{350}x^2$$

* Keep "a" in lowest terms.

Assignment: pg. 158 #~~7, 9, 10, 12, 13, 15 17, 21~~

7acd, 9ad, 10, 12, 13, 17, 21, 23

WHAT ARE YOU GEEKS DOING?

HAVING A MATH SHOWDOWN.

WE CHALLENGED EACH OTHER TO RECITE PI BACKWARDS.

WHOEVER GOES FIRST LOSES.

NO, I THINK WHOEVER ENTERS THIS ROOM LOSES.

I AM SO INFINITELY NOT CLOSE TO GOING.

HA! I'M INFINITELY-PLUS-ONE NOT CLOSE!