

Goal: Construct mathematical models of situations which are quadratic in nature.



Warm Up: in 2010, Hafiz bought a US bond for \$250 which pays out 3.1% APR for 10 years. How much will it be worth when he cashes it out next year?

Questions

Which Model is Which?

	Linear	Exponential	Quadratic
When to use			
Basic Shape			

Review Quadratic Function Properties

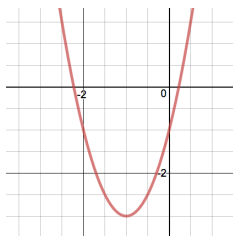
A *quadratic function* is an equation that can be put in the form _____ . The basic shape is a _____ . If $a > 0$, then _____ and _____ . If $a < 0$, then _____ and _____ . The domain is _____ and the range is _____ the max/min point, depending on direction of the graph. c is always the _____ . The x -intercepts are the _____ and only exist when _____ and can be found by _____ the

Quadratic Formula:

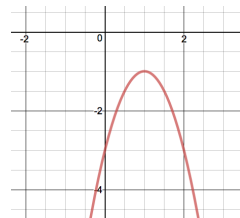
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} .$$

vertex can be found by

using $x = -\frac{b}{2a} .$



The



Questions

Example 1: Consider the function f with equation $f(x) = -3x^2 - 4x + 7$.

- a. Find the x - and y -intercepts. b. Find the vertex. Is it a max or min?

Using Known Quadratic Models

A common formula in physics to calculate the height, h , of an object

after time, t , can be found using $h = -\frac{1}{2}gt^2 + v_0t + h_0$, where g is

_____ or _____, v_0 is _____,
and h_0 is _____.

Example 2: A ball is thrown upward from a height of 15 m with initial velocity 20 m/sec.

- a. Find the relation between the height h and time t after the ball is released.

- b. How high is the ball after 3 seconds?

- c. When will the ball hit the ground?

How can we solve these using TI?

Example 3:

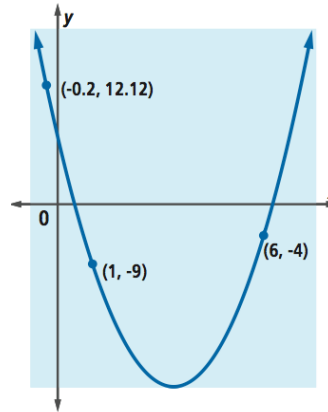
A projectile is shot from a tower 10 feet high with an upward velocity of 100 feet per second.

- a. Approximate the relationship between height h (in feet) and time t (in seconds) after the projectile is shot.
b. How long will the projectile be in the air?

Questions

Finding the Quadratic Model through Three or More Points

Example 4: The parabola to the right contains $(1, -9)$, $(6, -4)$ and $(-0.2, 12.12)$. Find its equation.



By way of TI-84:

1. Enter data into L1 and L2
2. Choose STAT → CALC → 5:QuadReg. Store: Y1
3. Graph using ZOOM → 0:ZoomFit
4. Round the coefficients to the nearest hundredths.

Example 5: The parabola to the right contains $(-0.1, -16.32)$, $(2, 3)$ and $(6, -9)$. Find its equation.

Example 6: The following table contains data that might be collected by farmers interested in increasing the weight of their pigs. Suppose twenty-four randomly selected pigs were each given a daily dosage (in pellets) of a food supplement. Each group of three pigs received a dosage from 0 to 7 pellets, and the average percent weight gain for each group was recorded. The table below shows the average percent weight gain for each group of three pigs in relation to the number of pellets they were given daily.

Dosage (pellets)	0	1	2	3	4	5	6	7
Percent Weight Gain	10	13	21	24	22	20	16	13

Summary: