Name: _____ Hour: _____ Date: _____

Quadratic Applications: Solving Real-World Examples by Graphing Notes & Practice

How would you describe the vertex of a parabola?

maximum or minimum

What do x-intercepts represent?

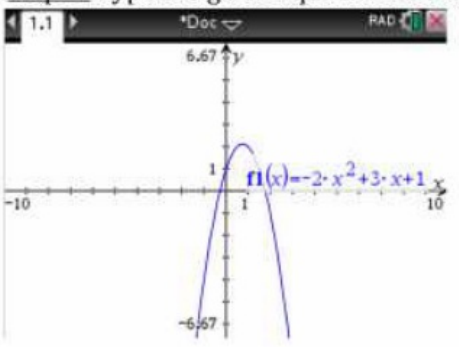
Solution, root, zero

Using the TiNspire to Solve Quadratic Applications by Graphing

1) Graph the equation $y = -2x^2 + 3x + 1$ and find the following: (a) the max or min (b) the x-intercepts.

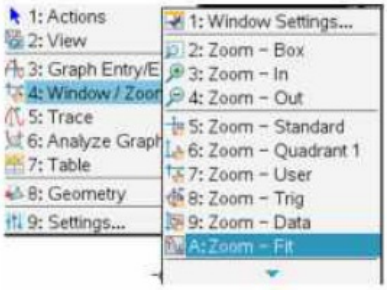
Step 1: Add a graph to a new document.

Step 2: Type the given equation into the graph screen.



Occasionally the default window does not allow us to see the features of the parabola that we are interested in finding out about. If that happens press the following to adjust the window:

Menu
"4: Window/Zoom"
"A: Zoom – Fit"



***** Important Note *****

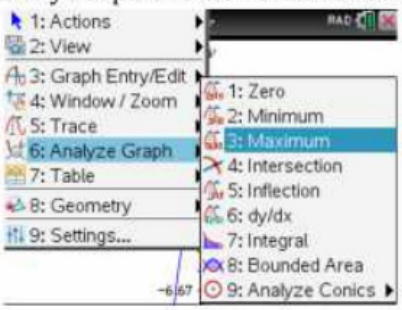
Occasionally "Zoom Fit" still doesn't give you the window that we want to be able to see the key features that we need.

If this happens follow the same instructions as listed above but select "4: Zoom Out" until you obtain the desired view of the parabola.

Step 3: Finding the Maximum or Minimum of the Parabola

You must first recognize whether your parabola's vertex is the maximum or minimum point.

Press the following keys:
Menu
"6: Analyze Graph"
"2: Minimum" OR
"3: Maximum"

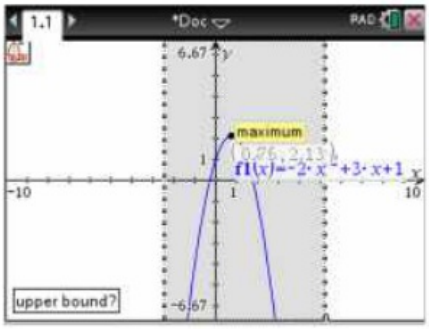


Set the "Lower Bound" and "Upper Bound" somewhere to the left and right of the vertex point. Calculator will then give you the point of the vertex.

Vertex of $y = -2x^2 + 3x + 1$:

(0.75, 2.13)

**** You will need to analyze this point for quadratic application problems ****

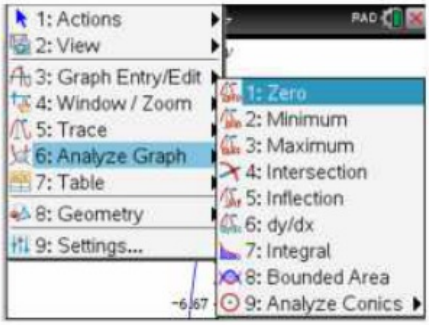


Step 4: Finding the x-intercepts, zeros, roots or solutions

Press the following keys:
Menu
"6: Analyze Graph"
"1: Zero"

Set the "Lower Bound" and "Upper Bound" to the left and right of each zero.

***** You will need to do this for each zero of the parabola, so long as it makes sense to do so in the context of the application problem you are answering.**
Most parabolas will have two roots although some have one or no zeroes. ***



Zeros of $y = -2x^2 + 3x + 1$: (-0.281, 0) and (1.78, 0)

Your Turn:

2) Graph $y = 2x^2 + 2x + 1$

a) Find the vertex and state if it is a maximum or minimum. (-0.5, 0.5)

b) Find the roots of the quadratic. None!

Using the graphing method to solve real-world problems:

3. ~~3) A~~ toy rocket is fired upward from the ground. The path of the rocket is given by the equation $h = -16t^2 + 128t$, where h is height measured in feet and t is time measured in seconds after the rocket was launched. Find the following:

x = time y = height

a) What is the maximum height that the rocket will reach?

(4, 256) 256 ft

b) When will the rocket reach the maximum height?

4 seconds

c) How long is the rocket in the air?

8 seconds

d) What is a reasonable domain and range for this quadratic model?

Domain: [0, 8] **Range:** [0, 256]

4. A ball is thrown into the air. The path of the ball is represented by the following quadratic model, $h = -t^2 + 8t$, where h is the height in feet and t is the time in seconds. Find the following:

x = time y = height

a) What is the maximum height of the ball?

16 ft

b) When will the ball reach its maximum height?

4 sec

c) How long is the ball in the air?

8 sec

d) What is a reasonable domain and range for this model?

D: [0, 8] R: [0, 16]

5. A ball is shot from a canon into the air. The equation that gives the height h of the ball at any time t is $h = -16t^2 + 40t + 1.5$, where h is the height in feet and t is the time in seconds.

x = time y = height

a) How long is the ball in the air?

2.54 sec

b) What is the maximum height that the ball will reach?

26.5 ft

c) How long will it take for the ball to reach the maximum height?

1.25 sec

d) What is a reasonable domain and range for this quadratic model?

D: [0, 2.54] R: [0, 26.5]

e) Sketch a graph to represent this quadratic model.