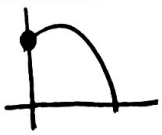
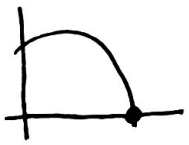
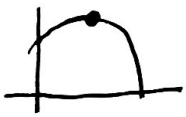
6.3 Quadratic Applications

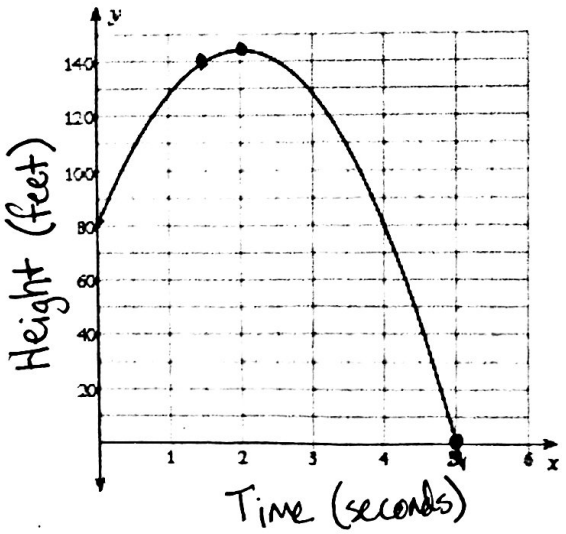
Different parts of the parabola can tell you certain pieces of information, and you will need to know each of these to be able to interpret the graph.

*Highlight the key words in each example that indicates the critical part.

Critical Part	Graph	Example
y –intercepts	 * Height is a y-variable	*Starting Point *At what height does the rocket start? y *At what height is the rock thrown?
x –intercept	 * Time/distance are x-variables	*At what time will the ball bounce off the ground? x *At what time will the arrow hit the ground? *After how many seconds does the rock hit the lake?
x –part of vertex	Time/distance of max/min height 	*After how many seconds does the rock reach it's maximum height? *How long does it take to reach the max. height?
y –part of vertex	Max/min height 	*What is the max. height the arrow reaches? *At what height does the rocket explode? *What is the ball's max. height?

Example 1: Use the graphs to make predictions and estimate key features of a given scenario.

1) A rocket carrying fireworks is launched from a hill above the lake. The rocket will fall into the lake after exploding at its maximum height. The rockets height above the surface is modeled by the parabola below.



i) At what height does the rocket start?

80 ft

ii) How high is the rocket after 1.5 seconds?

140 ft

iii) At what height will the rocket explode?

145 ft

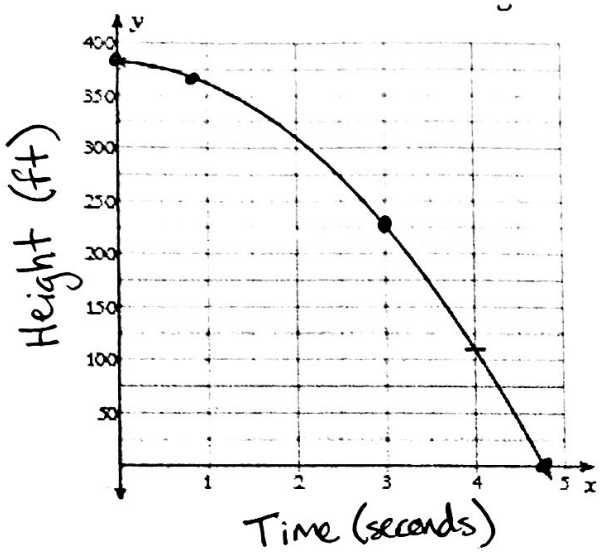
* If the answer does not hit an exact coordinate, take your best guess

iv) How long will it take the rocket to hit the lake?

5 seconds

* If you do not include units on your answer, you will be wrong

2) A rock is thrown from the top of a tall building. The distance, in feet, between the rock and the ground t seconds after it is thrown is modeled by the parabola below.



i) At what height is the rock thrown?

380 ft

ii) How long after the rock is thrown is it 370 feet off the ground?

0.8 seconds

iii) How high is the rock after 3 seconds?

225 ft

iv) If a person is walking under the building 4 seconds after the rock is thrown, will the rock hit the person?

No, the person is not 100 ft tall

v) How long does it take for the rock to hit the ground?

4.8 seconds

3) The path of an arrow show in the air can be modeled by the function: $y = -3(x-4)^2 + 142$, where y is the height, in feet, of the arrow above ground x seconds after it is released.

i) What is the maximum height the arrow reaches?

y-coordinate of vertex

ii) After how many seconds does it reach that height?

x-coordinate of vertex

iii) How high will the arrow be at 6 seconds? At 8 seconds?

x x

* If you have x, plug in to find y

$x = 6$ $y = -3(6-4)^2 + 142 =$ **130 ft**

$x = 8$ $y = -3(8-4)^2 + 142 =$ **94 ft**

iv) At about what time will the arrow land on the ground?

x-intercept

Graphing calculator: **10.88 seconds**

4) A ball is thrown into the air. The path of the ball is represented by the equation $h = -(t-4)^2 + 16$ where h represents height and t represents time.

i) What is the ball's maximum height?

ii) How long does it take for the ball to hit that maximum height?

iii) How high will the ball be after 5 seconds? 2 seconds?

iv) At what time will the ball bounce on the ground?