SM 2

Name:_____Period:_____

SM2 7.5 Quadratic Story Problems

Read each situation and answer the questions for each situation.

1. The cost *C*, in dollars, of manufacturing *x* bikes per week at a production plant is given by the function $C(x) = 2x^2 - 800x + 92,000$.

   a. Define your variables.

   $x =$ _____

   $y = C(x) =$ _____

   b. Sketch a rough graph of the cost equation. Be sure to label your axes. Use the y-intercept and the direction of opening to help draw the graph.

   c. How much does it cost to manufacture 50 bikes per week? Show your work.

   d. Find the number of bikes that must be manufactured each week to minimize the cost. Show your work.

   e. Find the minimum cost. Show your work.

2. The cost *C*, in dollars, of manufacturing *x* cars per week at a production plant is given by the function $C(x) = 2x^2 - 500x + 160,000$.

   a. Define your variables.

      $x =$ _____

      $y = C(x) =$ _____

   b. Sketch a rough graph of the cost equation. Be sure to label your axes. Use the y-intercept and the direction of opening to help draw the graph.

   c. How much does it cost to manufacture 45 cars per week? Show your work.

   d. Find the number of cars that must be manufactured each week to minimize the cost. Show your work.

   e. Find the minimum cost. Show your work.

3. The number of mosquitoes, *M*, in millions, in a certain area depends on the June rainfall, *x*, in inches: $M(x) = 8x - x^2$.

a. Define your variables.

$x =$ _____

$y = M(x) =$ _____

b. Sketch a rough graph of the cost equation. Be sure to label your axes. Use the y-intercept and the direction of opening to help draw the graph.

c. How many mosquitoes will the area have if it receives 3 inches of rain in June? Show your work.

d. What rainfall amounts would result in 12 million mosquitoes? Show your work.

e. How much rain results in the maximum number of mosquitoes? Show your work.

f. What is the maximum number of mosquitoes? Show your work.

4. In 1972, you could buy a Mercury Comet for about $3,200. Cars can depreciate in value pretty quickly, but a 1972 Comet in pristine condition may be worth a lot of money to a collector today. Use the formula, $C(t) = 18.75t^2 - 450t + 3200$, where *t* is the number of years after 1972, to answer the following questions.

a. Define your variables.

$x = t =$ _____

$y = C(t) =$ _____

b. Sketch a rough graph of the cost equation. Be sure to label your axes. Use the y-intercept and the direction of opening to help draw the graph.

c. What would the car be worth in 1997 (25 years later)? Show your work.

d. When is the car worth $1700? (Hint: Use quadratic formula.) Round to the nearest year. Show your work.

e. How many years until the car reaches its minimum cost? Round to the nearest year. Show your work.

f. What is the minimum cost? Show your work.

5. A model rocket is fired straight upward from the ground with an initial speed of 192 feet per second. It's height, *h*, in feet, after *t* seconds is given by the equation $h(t) = -16t^2 + 192t$.

a. Define your variables.

$x = t =$ _____

$y = h(t) =$ _____

b. Sketch a rough graph of the cost equation. Be sure to label your axes. Use the y-intercept and the direction of opening to help draw the graph.

c. How long does it take for the rocket to reach its maximum height? Show your work.

d. What is the maximum height of the rocket? Show your work.

e. What point on the graph tells you how long it would take the rocket to hit the ground?

f. How long will it take for the rocket to return to the ground? Show your work.

6. A rock is thrown upward off the top of a cliff. It's height in feet after *t* seconds is given by the formula $h(t) = -16t^2 + 64t + 80.$

a. Define your variables.

$x = t =$ _____

$y = h(t) =$ _____

b. Sketch a rough graph of the cost equation. Be sure to label your axes. Use the y-intercept and the direction of opening to help draw the graph.

c. What is the height of the cliff? (In other words, how high is the rock at $t = 0?$) Show your work.

d. How high is the rock after 3 seconds? Show your work.

e. Will the rock reach a height of 150 feet above the ground? (Hint: Find the maximum height and see if it's bigger or smaller than 150 feet.) Show your work.

f. At what times will the rock be 128 feet above the ground? Show your work.

g. How long will it take for the rock to hit the ground at the bottom of the cliff? Show your work.