Applications of Quadratics - Day 2

1. A firework is shot upward so that its distance, in feet, above the ground after t seconds is $h(t) = -13t^2 + 312t$.

a. Find the zeros of the function and explain the meaning in the context of the problem.

b. Find the vertex of the function and explain the meaning in the context of the problem.

2. From 1970-1990, the average cost of a new car *C* (in dollars) can be approximated by the model $C = 30.5t^2 + 4192$, where *t* is the number of years since 1970. During which year was the average cost of a new car $7,242?

3. The height $h(x)$ (in feet) of a ball thrown by a child is $h(x) = -\frac{1}{12}x^2 + x + 2$ where x is the horizontal distance (in feet) from where the ball is thrown.

a. How high is the ball when it is at its maximum height?

b. How high is the ball when it leaves the child's hand?

c. How far from the child does the ball strike the ground?

d. What is a realistic domain and range?

e. At a height of 4 feet how far has the ball gone?

4. A bottle rocket is fired from the ground upwards at 64 feet per second. Using the quadratic model $h(t) = -16t^2 + 64t$ find the following:

a. What is the maximum height the bottle rocket reaches?

b. How long does it take for the bottle rocket to hit the ground?

5. Suppose the cost of producing x crates of pencils is given by $C(x) = \frac{1}{2}x^2 - 10x + 1000$. Find the following:

a. How much does it cost to produce 100 crates of pencils?

b. How many crates of pencils will minimize the cost of production?

6. A geyser sends a blast of boiling water high into the air. During the eruption, the height *h* (in feet) of the water *t* seconds after being forced out from the ground can be modeled by $h = -16t^2 + 70t$. How long is the boiling water in the air?

7. A projectile is thrown upward so that its distance above the ground after t seconds is $h(t) = -12t^2 + 504t$. What is the maximum height of the projectile?

8. When an object is dropped, its height in feet, *h*, can be determined after *t* seconds by using the falling object model $h = -16t^2 + s$, where *s* is the initial height in feet. Find the time it takes an object to hit the ground when it is dropped from a height of 196 feet.

9. Find an expression that could represent the length and the width of a billboard given the area of the billboard is $A = x^2 + 14x + 48$.