Week 9 Homework: Quadratics and Break-Evens
Due Monday 10 April 2006
Mr. Quinn and Mr. Bowen

Find the vertex of each function. Determine if the vertex is a maximum or minimum.

16. $y = 4x^2 + 8x + 9$ **17.** $y = 5x^2 + 20x + 21$ **18.** $y = -3x^2 + 18x - 20$

19. You have 60 in. of molding to use as a frame around a picture you are painting. The area of the painting is given by the function $y = 30x - x^2$ where x is the width in inches. What width gives the maximum area for the painting? What is the maximum area?

20. You are trying to dunk a basketball. You need to jump 2.5 ft in the air in order to dunk the ball. The height that your feet are above the ground is given by the function $h = -16t^2 + 12t$. What is the maximum height your feet will be above the ground? Will you be able to dunk the basketball?

37. You and a friend are hiking in the mountains. You want to climb to a ledge that is 20 ft above you. The height of the grappling hook you throw is given by the function $h = -16t^2 - 32t + 5$. What is the maximum height of the grappling hook? Can you throw it high enough to reach the ledge?

38. The total profit made by an engineering firm is given by the function $p = f(x) = x^2 - 25x + 5000$. Find the minimum profit made by the company.

An archer shoots an arrow into the air such that its height at any time, t, is given by the function $h(t) = -16t^2 + kt + 3$. If the maximum height of the arrow occurs at time $t = 4$, what is the value of k?

What is the turning point, or vertex, of the parabola whose equation is $y = 3x^2 + 6x - 1$?

A baseball player throws a ball from the outfield toward home plate. The ball's height above the ground is modeled by the equation $y = -16x^2 + 48x + 6$ where y represents height, in feet, and x represents time, in seconds. The ball is initially thrown from a height of 6 feet.
How many seconds after the ball is thrown will it again be 6 feet above the ground?
What is the maximum height, in feet, that the ball reaches? [The use of the accompanying grid is optional.]

A rock is thrown vertically from the ground with a velocity of 24 meters per second, and it reaches a height of $2 + 24t - 4.9t^2$ after t seconds. How many seconds after the rock is thrown will it reach maximum height, and what is the maximum height the rock will reach, in meters? How many seconds after the rock is thrown will it hit the ground? Round your answers to the *nearest hundredth*. [Only an algebraic or graphic solution will be accepted.]

Part II: Break-Even Problems

32 A company calculates its profit by finding the difference between revenue and cost. The cost function of producing x hammers is $C(x) = 4x + 170$. If each hammer is sold for \$10, the revenue function for selling x hammers is $R(x) = 10x$.

How many hammers must be sold to make a profit?

How many hammers must be sold to make a profit of \$100?

31 The profit, P, for manufacturing a wireless device is given by the equation $P = -10x^2 + 750x - 9{,}000$, where x is the selling price, in dollars, for each wireless device. What range of selling prices allows the manufacturer to make a profit on this wireless device? [The use of the grid on the next page is optional.]

26 Island Rent-a-Car charges a car rental fee of \$40 plus \$5 per hour or fraction of an hour. Wayne's Wheels charges a car rental fee of \$25 plus \$7.50 per hour or fraction of an hour. Under what conditions does it cost *less* to rent from Island Rent-a-Car? [The use of the accompanying grid is optional.]

28 A pelican flying in the air over water drops a crab from a height of 30 feet. The distance the crab is from the water as it falls can be represented by the function $h(t) = -16t^2 + 30$, where t is time, in seconds. To catch the crab as it falls, a gull flies along a path represented by the function $g(t) = -8t + 15$. Can the gull catch the crab before the crab hits the water? Justify your answer. [The use of the accompanying grid is optional.]