Quadratic functions Solutions: NAME:
Maximums and minimums practice

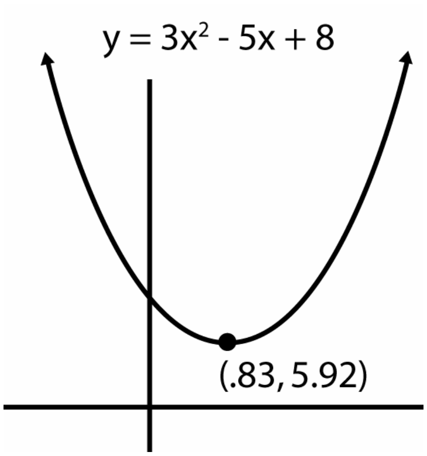
1. Without graphing, determine the vertex of the function $f(x) = 3x^2 - 5x + 8$.
Remember the vertex is a point; write it in ordered pair notation.

$$x = \frac{-b}{2a} = \frac{5}{2*3} = \frac{5}{6} = .83$$

$$f(.83) = 3(.83)^2 - 5(.83) + 8$$
$$= 5.92$$

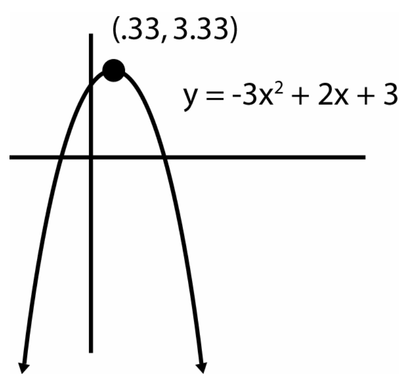
The x value is found by calculating $-b/2a$. *The y value that goes with this x value is found by putting this x value into the formula for f(x). The vertex is (.83, 5.92).*

2. Use your calculator to graph $f(x) = 3x^2 - 5x + 8$ below. Label the vertex in ordered pair notation. (You can start on the standard window but tweak the window values so you get a nicely spaced, accurate picture.)



3. Make up a quadratic function that opens downward and so will have a maximum. Draw it below and label the vertex. How did you ensure the vertex would be a maximum?

The "a" coefficient (in $y = ax^2 + bx + c$ *) needs to be negative for the parabola to open down and so will have a maximum. Let's try* $y = -3x^2 + 2x + 3$.



4. Alfonso owns an ice cream stand. His hot seller is an ice cream confection called Luscious Lemon Lickups. If he sells them for $1.25 each, he will sell 50 of them in a day. But if he lowers his price to $1, he can sell 80 of them in a day.

a.)Assume the relationship between price and number sold is linear. Find an equation to describe this relationship. Use x to denote price and y to denote number sold. [Start by writing the information in ordered pair notation (price, number sold). Find the slope between these two points, and then find the equation as shown in the Lines section of the notes.]

Start by writing the information in the form (1.25, 50) and (1, 80). Now, we'll find the slope between these points and develop the line's equation.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{80-50}{1-1.25} = \frac{30}{-.25} = -120$$

So the line must be of the form $y = -120x + b$ *where b is the y-intercept and (x, y) is any point on the line. Since we know two points on the line, let's use one of them to find b.*

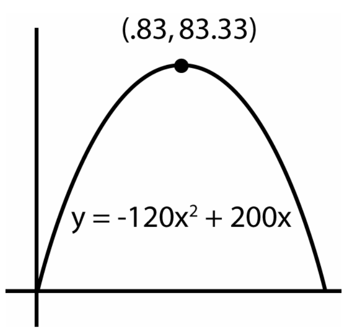
$$y = -120x + b$$
$$80 = -120(1) + b$$
$$200 = b$$

So b, the y-intercept, is 200. The line's equation is $y = -120x + 200$. *This tells us how price and number sold are related where x is price and y is number sold.*

b.) Now, revenue is the money he brings in. In this case, revenue equals price times number sold. Find an equation that shows the relationship between price and revenue. Label the revenue as $R(x)$.

$$R(x) = price * number\ sold$$
$$R(x) = x * y$$
$$R(x) = x(-120x + 200)$$
$$R(x) = -120x^2 + 200x$$

c.) Now graph this relationship and find the price he should charge to maximize his revenue. Draw the graph with the maximum labeled. Also, tell what this maximum revenue is as well as how many Luscious Lemon Lickups he should expect to sell.



I used a window of [0, 2] x [0, 100]. The maximum occurs at the point (.83, 83.33). This means that the maximum revenue is $83.33 and it is achieved if we charge $.83 for each Luscious Lemon Lickup. To figure out how many he will sell at that price, we need the formula $y = -120x + 200$. *Put .83 in for x to find the number sold will be 100 Lickups.*