

Monday 10/14/02

Names: _____

How Much Soap Can You Buy with Two Million Dollars?

You're in your new job as sales analyst for VariKleen Soap, Inc, when your bosses tell you, "We need a profit analysis on our new line of Very VariKleen soap." You have the following data: If you charge \$1 per bar of soap, you'll sell 2 million bars. If you charge \$2 per bar, you'll sell 1.5 million bars of soap.

1. Make a linear model $p(q)$ of the price, p , you should sell the soap at if you want to sell q million bars. (Note that q will be in millions of bars. You'll have values like $q=2$ or $q=1.5$ and NOT values like $q=2,000,000$ or $q=1,500,00$.)

2. Your **revenue**, R , is the total amount of money you take in, in this case from selling soap. It's given by the formula $R=qp$, where q is the number of items sold and p is the price you sell them at. Think about why this makes sense, and then plug your answer from part 1 into this formula to get rid of the p in the above formula. You should get $R(q)$, a function of only q . This function tells you how much money you'll bring in if you sell q million items.

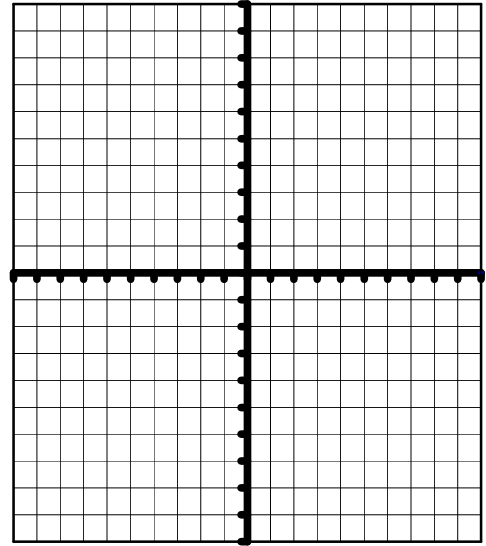
3. Find the values of q where your revenue is zero. Do these make sense? Graph $R(q)$ on the graph on the next page with q along the x-axis and millions of dollars along the y-axis.

4. Your **profit**, P , is your revenue minus expenses. It's given by the formula $P=R-C$, where C are the costs you incur.

Example: You make \$400 a week at your job, but have to pay \$350 in bills every week. Your revenue is $R=400$. Your costs are $C=350$. Your profit (how much you've made) is $P = R - C = 400 - 350 = 50$ dollars. In the case of VariKleen Soap, the costs you incur are due to production, shipping, advertising, etc. You know that your costs are given by the function

$$C(q) = \text{FIXMEEEEEEEEEEE}q^2 - 13q + 15. C(q)$$

GOES NEGATIVE!!!! YUCK!!! Find the formula $P(q)$ for your profit. (Be careful not to get the price, p , mixed up with the Profit, P .)



5. Using the fact that $C(q)$ is a parabola, graph $C(q)$ on the same graph as R .

6. Using the vertex formula, find the q where you attain your maximum profit. Draw the vertical line on the graph that corresponds to this value of q . If you drew $R(q)$ and $C(q)$ right, this should be a special point in some way. How is it special? Can you say why the maximum profit is at the q value where this happens?