Learning Goal:

By the end of today, I will be able to use a variety of methods (table of values, graphing calculator, algebra technique) to solve quadratic problems.

Oct 8-7:40 PM

Example

A computer software company models the profit on its latest video game using the function $P(x) = -2x^2 + 32x - 110$, where x is the number of games, in thousands, that the company produces and $P(x)$ is the profit, in millions of dollars.

How can you determine the maximum profit the company can earn?

Oct 8-7:28 PM

Matt's Solution: Using a Table of Values

x	$P(x)$
0	−110
2	−54
4	−14
5	0
6	10
7	16
8	18
9	16

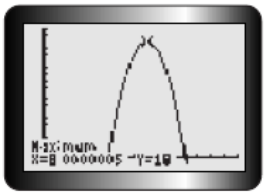
I used different values for x and then picked the highest number in the $P(x)$ column for the maximum profit.

The highest value of $P(x)$ is 18, and it occurs when $x = 8$.

The company must sell 8000 games to earn a profit of $18 million.

Oct 8-7:40 PM

Tony's Solution: Using a Graphing Calculator



I used a graphing calculator. I entered $-2x^2 + 32x - 110$ into Y1 and then used the maximum operation.

According to the graphing calculator, the maximum is 18 when $x = 8$. At first I thought that meant that the company must sell 8 games to earn a profit of $18, and that's not much profit. Then I remembered that the function is for x thousand games and $P(x)$ is in millions of dollars.

The number of games they must produce to make a maximum profit is 8000. The profit will be $18 million.

Oct 8-7:39 PM

Donica's Solution: Factoring

$P(x) = -2x^2 + 32x - 110$ ← This is an equation of a parabola that opens downward, since the coefficient of x^2 is negative.

$P(x) = -2(x - 5)(x - 11)$ ← The maximum value is at the vertex, which is halfway between the function's two zeros. So I factored $P(x)$ to find the zeros. I set each factor equal to zero to solve.

$x - 5 = 0$ and $x - 11 = 0$

$x = 5$ and $x = 11$

The maximum occurs at

$x = \frac{5 + 11}{2}$ ← The maximum is halfway between the zeros. I added the zeros and divided by 2.

$x = 8$

$P(8) = -2(8^2) + 32(8) - 110$ ← I put 8 into the profit function to get $P(8) = 18$.

$= 18$

The company must sell 8000 games to earn a profit of $18 million.

Oct 8-7:39 PM

Reflecting

A. Can Matt always be certain he has determined the maximum value using his method?

B. Will Donica always be able to use her method to determine the maximum (or minimum) value of a function? Explain.

C. How do you know that each student has determined the maximum profit and that no other maximum could exist?

D. Why is finding the domain and range important for quadratic equations that model real-world situations?

E. How do you choose your strategy? What factors will affect the method you choose to solve a problem?

Oct 8-7:36 PM

Consolidation Questions:

page 168-9 #1, 3, 6, 9

Oct 8-7:43 PM