Name: _____ Blk: _____ Date: _____

PreCalc Math 11

5.6 Applications of Quadratic Functions

Set up a _____ _____ _____ problem to find out its _____. As you know, the vertex is the _____ or _____ point, which is always of interest in word problems.

Example 1: Find two numbers whose product is a minimum, and they differ by 10.

STEP 1: State your _____.

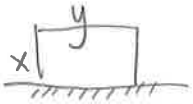
STEP 2: Write an _____ for the thing you're trying to _____ or _____. You should only have _____ variables. This means you might have to _____ one variable in terms of the other and then _____ it in the max/min equation.

STEP 3: _____ _____ _____. Then answer the original question.

Example 2: Maximize the rectangular area of 100 m of fencing if there are

a) 4 sides of enclosed fencing

b) 3 sides of fencing, 1 side is the barn



$2x+y=100$

$y=100-2x$

$A = xy$

$= x(100-2x)$

$= -2x^2+100x$

$= -2(x^2-50x)$

$\left(\frac{-50}{2}\right)^2 = 625$

$= -2(x^2-50x+625-625)$

$= -2(x^2-50x+625) - 2(-625)$

$A = -2(x-25)^2 + 1250$

$625 \times 2 = 1250$

$V(25, 1250)$

x ↑ ↑ max Area

$x = 25\text{m}$

$y = 100-2x$

$= 100-2(25)$

$y = 50\text{m}$

Length is 50m
Width is 25m.

Example 3: What price gives maximum revenue? Mannesha sells math cheat sheets for $20. There are 300 students willing to buy at this price. For every $5 increase in price, 30 fewer students will buy. What price gives the maximum profit?

# of $5 increases	Price	# Sold
x	$20+5x$	$300-30x$

Profit = price × # sold

$P = (20+5x)(300-30x)$

$= 6000 - 600x + 1500x - 150x^2$

$= -150x^2 + 900x + 6000$

$= -150(x^2 - 6x) + 6000$

$\left(\frac{-b}{2}\right)^2 = 9$

$= -150(x^2 - 6x + 9 - 9) + 6000$

$= -150(x-3)^2 - 150(-9) + 6000$

$= -150(x-3)^2 + 7350$

$v(3, 7350)$

x = # of $5 increases; P = max profit

price $= 20 + 5(3)$

$= \$35$

$35 price yields max profit of $7350.

SHORTCUT to finding the vertex in a quadratic function in general form: $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$:

Find the vertex of: $f(x) = -\frac{1}{2}x^2 + 6x + 1$ *Use this only as a check. If I ask you to complete the square, you must complete the square*

HW: Section 5.6 #1-6 (skip 5), 7, 9, 12, 13; Quiz next day on 5.3, 5.4 & 5.6