Finding Extrema using Zeros

Given the following trinomials, factor each to find the zeros:

1. $x^2 + 8x + 15 = 0$ 2. $x^2 - 13x + 42 = 0$ 3. $x^2 + 2x - 24 = 0$

Discuss with your partner what you'd expect the graph to look like based on this information.

Polynomial	Factors	Zeros	Average of the Zeros

Analyze the Data:

1. Graphically inspect each polynomial to find any connections between the zeros and the graph.

2. What patterns do you see?

3. Given the equation $x^2 - 2x - 35 = 0$, without looking at the graph, where would you expect the minimum to be located?

$x^2 - 2x - 35 = 0$

$(x+5)(x-7)=0$ Factor

$x+5=0 \quad x-7=0$ Set each factor = 0 and solve

$x=-5, x=7$

$\frac{-5+7}{2}=1$

$x=1$ Average the zeros to find the x value of the minimum

But there are two numbers in an ordered pair. How could you find the y – value for the previous example?
Remember with function notation, whenever we know an x – value, we can substitute to find the y – value.

Our x – value for the minimum was x = 1. So we'll substitute the 1 in for x in our original polynomial.

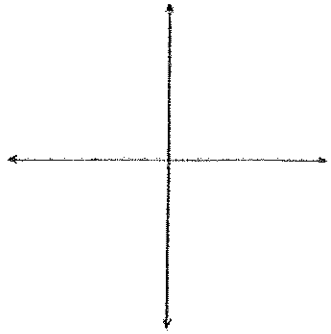
$(1)^2 - 2(1) - 35 = 1 - 2 - 35 = -36$

So our minimum is (1, -36)

Why would this be important to know?

Without using a calculator, it will make sketching a graph much easier! Try graphing the next problem without a calculator.

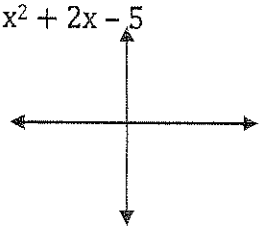
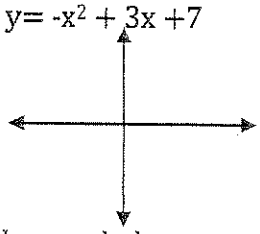
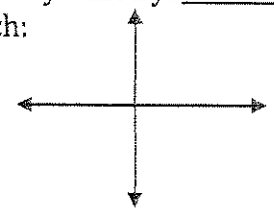
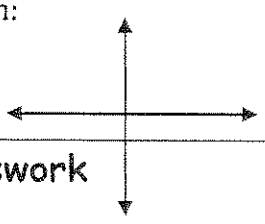
$x^2 + 2x - 8 = 0$



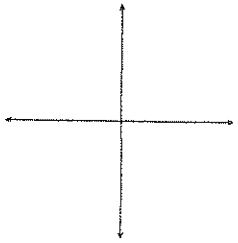
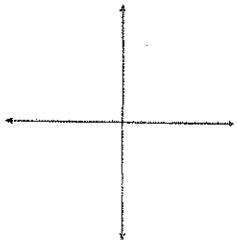
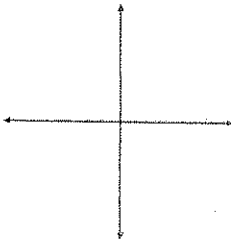
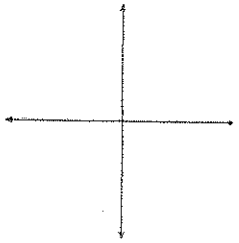
Let's remember everything we know:

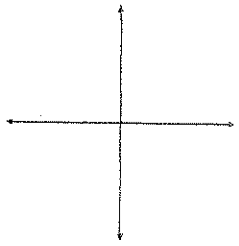
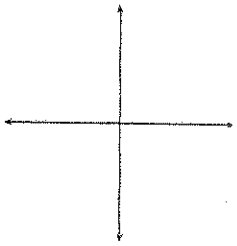
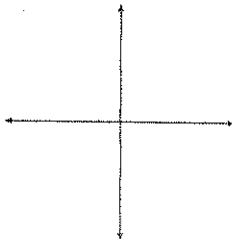
Polynomial	y – intercept	Zeros	Minimum
$x^2 + 2x - 8$			

Quadratic Equations

Main Idea/Questions	Notes
Standard Form	All quadratic equations are written in the form:
Graph	When graphed, a quadratic equation creates a U-shaped curve called a _____
Types of Parabolas	Using your graphing calculator, sketch the following: $y= x^2 + 2x - 5$  $y= -x^2 + 3x + 7$  • If 'a' is _____, then the parabola opens _____, like a smile ☺ • If 'a' is _____, then the parabola opens _____, like a frown ☹
Axis of Symmetry	_____ _____ Formula for Axis of Symmetry:
Vertex	_____ • When the vertex is the _____ it is called a _____ • When the vertex is the _____ it is called a _____ • Use the _____, x, and solve for y to get the _____
Example 1 $y= x^2 + 8x + 15$	Axis of Symmetry: _____ Vertex: _____ Min/Max? _____ Sketch: 
Example 2 $y= -x^2 + 5x - 6$	Axis of Symmetry: _____ Vertex: _____ Min/Max? _____ Sketch: 

Finding Zeros Classwork

Polynomial	Y-Intercept	Zeros	Minimum/ Maximum Point	Graph
#1 $y = x^2 + 8x + 12$				
#2 $2x^2 - 6x - 56 = y$				
#3 $x^2 - 6x = -9$				
#4 $x^2 + 10x = -25$				

Polynomial	Y-Intercept	Zeros	Minimum/ Maximum Point	Graph
#5 $x^2 - x = 20$				
#6 $y = x^2 - 25$				
#7 $y = 2x^2 - 3x - 20$				
#8 $3x^2 + 20x = -12$