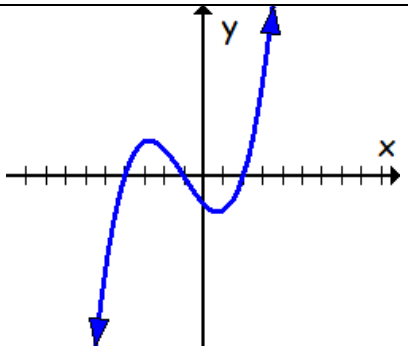
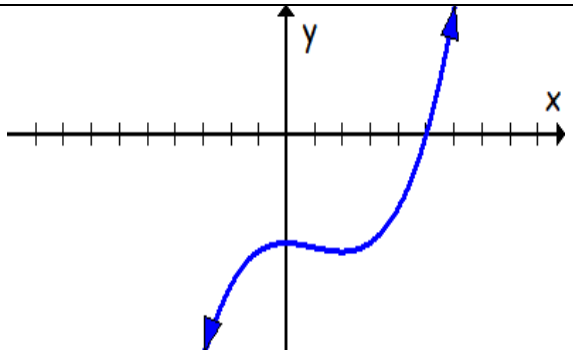
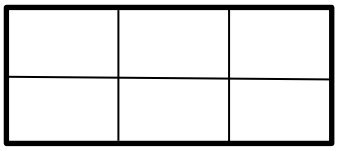
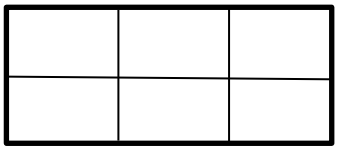
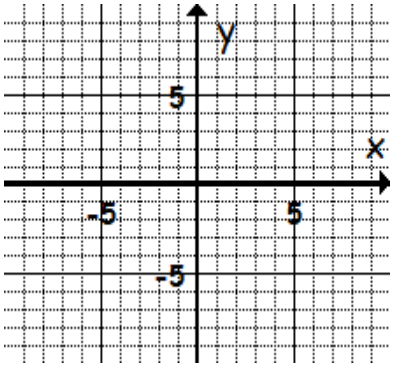
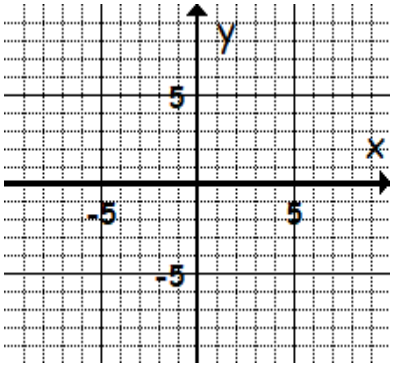
AA7-2 investigation
Complex roots

Name _____

What are complex roots? Compare these two polynomials.

	$Y = x^3 + 3x^2 - 6x - 8$	$Y = x^3 - 5x^2 + 16x - 80$
Graphically: Note: x-intercepts are called real roots.	 Polynomial degree _____ Number of x-intercepts_____	 Polynomial degree _____ Number of x-intercepts_____
Algebraically: Write each equation in fully factored form.		
X-intercepts are called "real roots". Each real root has a factor, as we can see above. The question, how do we factor an equation and write it in fully factored form if there are non-real roots?		Using the zero product property and our new imaginary number, i we can find non-real roots, which are called **complex roots**. Solve: $0 = x^2 + 16$ Now write the fully factored form of $Y = x^3 - 5x^2 + 16x - 80$ Y = ( )( )( )

Graph and write the equations of these parabolas in fully factored form:

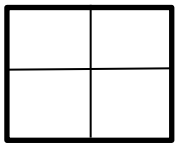
$Y = x^2 + 1$	$Y = - x^2 - 4$
	
Real roots:	Real roots:
Factored form:	Factored form:

Writing standard form quadratic equations with complex roots:

Example: Write the equation of the parabola with complex roots at $7i \quad and \quad -7i$.

Step 1: Write the factored form: _____

Step 2: Multiply the factors:



Step 3: Write the equation: _____.

Reflection:

1. How can you determine if a polynomial will have complex roots from a graph?

2. How can you determine if a polynomial will have complex roots from an equation?

AA7-2 Name _____

Complex roots:

Check for Understanding:

Which equations will have complex roots:

$y = x^2 + 51$ $y = x^2 - 25$ $y = -x^2 - 13$ $y = -x^2 + 42$

Practice: C-Level

1) Rewrite each equation in fully factored form.

a) $y = x^2 + 36$

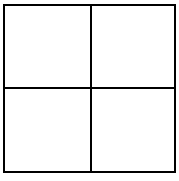
b) $y = 2x^2 + 50$

c) $y = x^2 + 27$

d) $y = x^2 + 98$

2) Find the equation of a quadratic that has the following roots.

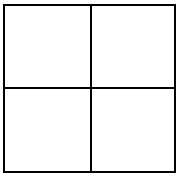
a) complex roots at: 3i and -3i



Factored form: _____

Standard form: _____

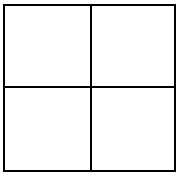
b) complex roots at: 2i and -2i



Factored form: _____

Standard form: _____

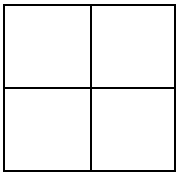
c) complex roots at: $i\sqrt{3}$ and $-i\sqrt{3}$



Factored form: _____

Standard form: _____

d) complex roots at: $i\sqrt{2}$ and $-i\sqrt{2}$



Factored form: _____

Standard form: _____

Practice B-Level

3) Rewrite each equation in fully factored form.

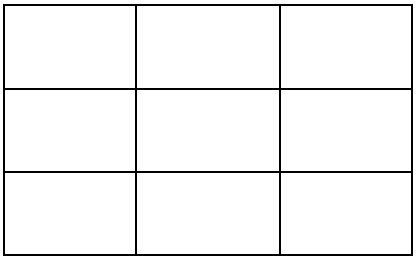
a) $y = x^3 + 5x^2 + 9x + 45$ with a root at (-5,0)

b) $y = -x^3 - 5x^2 - 16x - 80$ with a root at (-5,0)

4) Find the equation of a quadratic that has complex roots at: 5 + i and 5 – i

Factored form:_____

Standard form: _____



Looking ahead:

Find the complex roots of: $y = x^2 - 4x + 5$