Unit 7: Factoring and Solving Polynomial Functions

Day 1 – Long Division

Objectives: SWBAT Factor and Divide Polynomials

Review:

1. 12)502

a. 4,543÷83

Polynomial Long Division

 $2x^{2} + x - 5$ $x-3 \quad 2x^{3} - 5x^{2} - 8x + 15$ $\underline{2x^{3} - 6x^{2}}$ $x^{2} - 8x$ $\underline{x^{2} - 3x}$ -5x + 15 $\underline{-5x + 15}$ Remainder 0

Divide the following expressions using polynomial long division.

3. $(x^3 - 6x^2 + 9) \div (x - 4)$ **4.** $(4x^4 + 5x^2 - 9x + 18) \div (x^2 + 2x + 4)$

Day 2 – Synthetic Division

Objectives: SWBAT Factor and Divide Polynomials

Synthetic Division

Dividing Polynomials

Synthetic Division

$$2x^2 + x - 5$$
 $3 - 5x^2 - 8x + 15$
 $3 - 6x^2$
 $x^2 - 8x$
 $x^2 - 3x$
 $-5x + 15$

Synthetic Division

 3
 2

 $2 - 5 - 8$
 $5 - 6x^2$
 $x^2 - 8x$
 $x^2 - 3x$

$$2x^{2} + x - 5$$

$$x-3 \quad 2x^{3} - 5x^{2} - 8x + 15$$

$$\underline{2x^{3} - 6x^{2}}$$

$$x^{2} - 8x$$

$$\underline{x^{2} - 3x}$$

$$-5x + 15$$

$$\underline{-5x + 15}$$
Remainder 0

Divide the following expressions using synthetic division.

1.
$$(x^3 + 4x^2 - 5x + 3) \div (x + 2)$$

2. $(2x^3 + 3x^2 - 6) \div (x - 3)$

3. $(7x^2 - 14x + 4) \div (x + 2)$ **a.** $(3x^4 - 7x^2 + 14x - 9) \div (x - 1)$

Day 3 – Apply the Remainder and Factor Theorems

Objectives: SWBAT Factor a polynomial given a factor

FACTOR THEOREM or Throw Me a Bone Theorem

Fundamental Rule of Algebra

X Box vs Shortcut

Factor Completely

1.
$$f(x) = x^3 - 6x^2 + 5x + 12; x - 4$$



2. $y = x^3 - 9x^2 - 4x + 36$; x - 4

How many Answers will there be?		Will I need to do the X or X Box in this example?		
Synthetic Division	Factoring			
	Spec	vou add to		
Answer				



a. $f(x) = 2x^3 - 11x^2 + 3x + 36; x - 3$



<u>Day 4 – Apply the Remainder and Factor Theorem to</u> <u>Solve for Zeros</u>

Objectives: SWBAT Factor a polynomial given a factor SWBAT Find all the zeroes of a polynomial given a zero

FACTOR THEOREM

Zeros

Finding Zeros

Fundamental Rule of Algebra

Given polynomial function f(x) and a zero of f(x), find the other zeros.

1. $f(x) = x^3 - 28x - 48; x = -2$





How many Answers will there be?		Will I need to do the X or X Box in this example?		
Synthetic Division	Factoring			
	Spec	vou add to		
	Solvinį	g		
Answer				

3.
$$f(x) = x^3 - 28x - 48; x = -2$$



a. $y = x^3 + 5x^2 + 2x - 8; x = -4$



Synthetic Division with Fractions

4.
$$f(x) = 2x^3 - 18x - x^2 + 9; x = \frac{1}{2}$$

$$f(x) = 3x^3 - 4x^2 - 17x + 6; \quad \frac{1}{3}$$

How many Answers will there be?		Will I need to do the X or X Box in this example?		
Synthetic Division	Factoring			
	Spec	ial Number you add to		
	Solving	g		
Answer				

<u>Day 7 – Apply the Rational Zero Theorem – Finding</u> <u>Lists of Zeros</u>

Objectives: SWBAT find the possible number of zeros without given a calculator

Leading Coefficient

Constant

RATIONAL ZERO THEOREM

List the possible rational zeros f using the rational zero theorem.					
$f(x) = x^3 + 2x^2 - 11x + 12$	2. $f(x) = 4x^4 - x^3 - 3x^2 + 9x - 10$				
Factors of the constant term:	Factors of the constant term:				
Factors of the leading coefficient:	Factors of the leading coefficient:				
Possible rational zeros:	Possible rational zeros:				
Simplified list of zeros:	Simplified list of zeros:				

Total Number of Possibilities	Total Number of Zeros

Total Number of Possibilities	Total Number of Zeros

3. $f(x) = 2x^3 + 3x^2 - 11x - 6$

Factors of the constant term:

Factors of the leading coefficient:

Possible rational zeros:

a. $f(x) = x^4 - 8x^3 + 18x^2 - 27$

Factors of the constant term:

Factors of the leading coefficient:

Possible rational zeros:

Simplified list of zeros:

Simplified list of zeros:

Total Number of Possibilities	Total Number of Zeros

Total Number of Possibilities	Total Number of Zeros

Day 8 – Apply the Rational Zero Theorem

Objectives: SWBAT find the zeros of polynomials (with an a=1) without being given a factor

STEPS TO FINDING ALL REAL ZEROS when a = 1

1.	List all possible	, aka	
2.	Test these	using	
	HINT!!!	You may have to do this more than once	
3.	Repeat using	until the degree of the	
po	lynomial is		

4. Factor the polynomial and solve.

Find all real zeros of the function.

1. $f(x) = 2x^3 + 3x^2 - 11x - 6$

How many Answers will there be?			Will I need to do the X or X Box in this example?			
Possible Solutions:			Simplified List of Zeros	đ		
Synthetic Di	vision	Factoring				
		Solving	al Number you add to			
Answer						

How many Answers will there be?			Will I need to do the X or X Box in this example?		
Possible Solutions:			Simplified List of Zeros		
Synthetic Di	vision	Fact	toring		
		Solving	you add to		
	Answer				

a. $h(x) = 4x^3 - 12x^2 - x + 15$



4. Cassie is building a wooden square sandbox for a local playground. She wants the volume of the box to be 16 cubic feet. She decides that the height of the box should be x feet, and that she would like the length of each side of the square base to be three feet longer than the height. What dimensions should she build her sandbox?

Day 9 – Find Rational Zeros via a Calculator

Objectives: SWBAT find the zeros of polynomials without being given a factor

BEHAVIOR NEAR ZEROS



2.

Passes Through

Find all the zeros from the graph below.







<u>Find the number of solutions or zeroes for each equation or function.</u> Then look at the graph on a calculator decide how many real solutions and imaginary solutions there are.

3.	$x^{3} +$	$-5x^2$	+4x	+20	=0
U .	A 1	JA	1 1 1	1 20	- 0

b. $f(x) = x^4 - 8x^3 + 18x^2 - 27$

 Number of Solutions:

 Number of Real Solutions:

 Number of Imaginary Solutions:

 Number of Imaginary Solutions:

<u>Use a Calculator to help you find all the zeros, and then prove they are zeros</u> <u>algebraically.</u>

4. $2x^4 + x^3 - 3x^2 - x + 1$

c. $x^4 + 8x^3 + 16x^2$