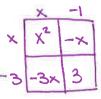
Integrated Math 3 Unit 6: Polynomials 6.12

Date: _____ Period: ____

Objective: To factor a polynomial function using the factor theorem and find the zero of a function.

Warm Up: Given $y = x^2 - 4x + 3$

a. Write the quadratic equation in factored form.



b. Why is the equation in part (a) also called intercept form?

It gives you the values of the x-intercepts - all you need to do is split the factors and set them equal to Zero, and then Solve for x

Vocabulary:

Factor Theorem: A polynomial f(x) has a factor (x - k) if and only if f(k) = 0. This is the same as saying k is a zero of the function.

Remainder Theorem: If a polynomial f(x) is divided by (x - k), then the remainder is r = f(k).

Example 1: Is (x + 1) a factor of $x^3 - x^2 + 2$?

$$(-1)^3 - (-1)^2 + 2$$

= -1-1+2

Yes, it is a factor.

Example 2: Use the remainder theorem to find the remainder for each division. State whether the binomial is a factor of the polynomial.

a.
$$(x^2 - x + 4) \div (x - 2)$$

 $(2)^2 - (2) + 4$
 $= 4 - 2 + 4$

b.
$$(x^3 + x^2 - 17x + 15) \div (x + 5)$$

 $(-5)^3 + (-5)^2 - 17(-5) + 15$

Remainder? yes because 6+0

c.
$$\frac{(x^2+20x+91)}{x+7} + K = -7$$
$$(-7)^2 + 20(-7) + 91$$
$$= 0$$

$$K=3$$
d. $(x^3 - 9x^2 + 27x - 28) \div (x - 3)$

$$(3)^3 - 9(3)^2 + 27(3) - 28$$

$$= -1$$

Steps to factoring using the factoring theorem

- 1. Write the function in standard form
- 2. Set up the area model
- 3. Find the factor that was used to multiply (x-k) to get the polynomial by working backwards.
- 4. Identify your answer:
 - a) If there is no remainder, k is the x-intercept (and a factor of the polynomial)
 - b) If there is a remainder, plug k in to the polynomial to confirm that k is not a factor.

Example 3: Factor using the area model.

a.
$$f(x) = 2x^3 + 11x^2 + 18x + 9$$
 when $k = -3$

b.
$$f(x) = 3x^3 + 13x^2 + 2x - 8$$
 when $k = -4$

$$2x^{2}$$
 5x 3
 $2x^{3}$ 5x² 3x
 $3(6x^{2})$ 15x 9

$$3x^{2} \times -2$$
 $\times 3x^{3} \times -2$
 $4 \times 12x^{2} \times 4x \times -8$

$$f(x) = (x+3)(2x^{2}+5x+3) \times 1$$
Mutt:
$$(0x^{2} 2x 2x^{2} 2x 4x 4x 5x 3 3x 3$$

$$f(x) = (x+3)(2x+3)(x+1)$$

Mult:
$$-10x^2$$
Add: $-x$
 $3x^2 - 3x$
 $2x - 2$

Example 4: Factor and then find all the zeros of the function.

a.
$$f(x) = x^3 - 2x^2 - 9x + 18$$
 when $k = 2$

						CXTO
b.	f(x)	$=x^3$	$+6x^{2}$	$^{2} + 3x$	– 10 wh	en k = -5

114	X2	Ox	-9
×	X³	Ox²	-9x
- 2	-2x2	Ox	18

$$f(x) = (x-2)(x^2-9)$$

difference
of squares!

$$f(x) = (x+5)(x^2+x-2)$$

Mule: $-2x^2$

Add: x
 -1
 $-x$
 -2

f(x) = (x-2)(x-3)(x+3)