Integrated Math 3
Unit 6: Polynomials
6.12

Name: ______________________________

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?

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 $x^3 - x^2 + 2$?

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

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

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

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

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

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 $k = -4$

<u>Example 4</u>: Factor and then find all the zeros of the function.

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

b. $f(x) = x^3 + 6x^2 + 3x - 10$ when $k = -5$