Thursday 11/21/19

1. Warm-Up
2. Go Over U3 Part 1 Test
3. Remainder/Factor Thm Notes
4. Would You Rather...

Topic: Remainder and Factor Theorems **Name:** _____

What am I learning today?

Warm-Up

Evaluate the following:

1) $f(x) = 2x^3 + 4x^2 - 8x - 16$

a) $f(6)$ $= 2(6)^3+4(6)^2-8(6)-16$ $= 612$

b) $f(-2)$ $= 2(-2)^3+4(-2)^2-8(-2)-16$ $= 0$

Divide using synthetic division.

f(3) = 72

2) $f(x) = 4x^3 - 2x^2 + x - 21$; $(x-3)$ $x-3=0$ $x=3$

$4x^2+10x+31+\frac{72}{x-3}$

3 | 4 −2 1 −21

↓ 12 30 93

4 10 31 | 72

x^2 x c

Notes
The Remainder Theorem

The Remainder theorem can help us find the remainder of a polynomial without using synthetic division.

> The **Remainder Theorem** states that the remainder of a polynomial f(x) divided by (x – c) is equal to f(c).

Examples

Ex 1: Use synthetic division to find the remainder.

$f(x) = 7x^3 - 3x^2 + 6x - 5$; $(x-3)$ $x-3=0$ $x=3$

3 | 7 −3 6 −5

↓ 21 54 180

7 18 60 | 175

Using the remainder theorem we can now evaluate to find the remainder.

$f(3) =$ 175 $7(3)^3-3(3)^2+6(3)-5$

Ex 2: Use synthetic division and the remainder theorem to find the remainder of the polynomial.

$f(x) = 2x^4 + x^2 - 4x + 8$; $x = -2$ $f(-2)=2(-2)^4+(-2)^2-4(-2)+8$

−2 | 2 0 1 −4 8

↓ −4 8 −18 44

2 −4 9 −22 | 52

$f(-2) = 52$

Review...Using the following polynomial:

$$f(x) = (x + 1)^2(x - 2)$$

$x+1=0$
$x=-1$
$x-2=0$
$x=2$

1. Find the zeros: x = -1 x = 2

2. Multiply out the polynomial: f(x)= x^3-3x-2

3. Do synthetic division (twice) w/your two zeros:

a. -1 | 1 0 −3 −2

	0	−1	1	2
	1	−1	−2	0

$f(-1)=0$

b. 2 | 1 0 −3 −2

		2	4	2
	1	2	1	0

$\therefore f(2)=0$

4. What do you notice about your remainders?

Topic: Factor and Remainder Theorems **Date**: _____

Notes
The Factor Theorem

RECALL: An **x-intercept** is where a function crosses the x axis.

X-INTERCEPT = zero = root

> The **Factor Theorem** states that a polynomial f(x) has a factor (x – c) if and only if f(c)=0.

If an x-value is a zero of a function then we know that $f(x) =$ 0.

Examples

Use the remainder theorem and synthetic division to determine whether the given value is a zero of the polynomial.

Ex 1. $f(x) = x^3 - x^2 - x - 2;\ x = 2$

$f(2) = (2)^3 - (2)^2 - (2) - 2$

$= 0$

2 | 1 −1 −1 −3

↓ 2 2 2

1 1 1 | 0

★ yes, x=2 is a zero of the polynomial

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

3 | 4 −5 2 −1

↓ 12 21 69

4 7 23 | 68

✦ No, x=3 is not a zero!

You Try

Use the remainder theorem and synthetic division to determine whether the given value is a zero of the polynomial.

1) $f(x) = 5x^3 - 3x^2 + 2x + 10;\ x = -1$

Summary
Summarize the lesson in your own words