**2.3 Polynomial and Synthetic Division**

**Objective:** To understand (and potentially never use) synthetic division to find zeros and remainders

**Division of Polynomials:** Useful for factoring and finding zeros

**Long Division:** divide by linear and other polynomials (won’t use!!)

**Synthetic Division**: simplifies long-division by dividing by a linear expression .

When dividing a polynomial by an expression of the form **x – a**, you can use synthetic substitution as a form of synthetic division.

* The final constants equal the coefficients of the quotient
* Exponents for the quotient = exponent from original – 1

(For each column)

**Steps to using Polynomial Synthetic Division:**

* Write the equation in standard form

(put 0’s in for exponents not represented)

* Multiply leading coefficient by the value of the variable
* Sum the next coefficient with the answer from Step 2
* Multiply the answer from Step 3 by the value of the variable
* Sum the next coefficient with the answer from Step 4
* Continue until each coefficient has been used

Example 1: Divide Using Synthetic Division.

f(x) = 2x4 – 8x2 + 5x – 7 divided by

2x4 + 0x3 – 8x2 + 5x – 7

2 0 -8 5 -7

3 6 18 30 105

2 6 10 35 98

2x4 – 8x2 + 5x – 7=**(2x3 +6x2 + 10x +35)(x-3) +98**

**Remainder Theorem**;

If a polynomial f(x) is divided by x – k, then the remainder is r = f(k)

Example 1:

Given that f(x)= 2x4 – 8x2 + 5x – 7, what is f(x)

By the Remainder Theorem, f(3) is the remainder when you divide f(x) = 2x4 – 8x2 + 5x – 7 by x-3

2x4 + 0x3 – 8x2 + 5x – 7

2 0 -8 5 -7

3 6 18 30 105

2 6 10 35 **98**

So, f(3)=98

**Homework**

Pg 157 #55, 59, 61, 67, 69, 75

Pg 146 #48-49, 51