

Ch 3.3: Division of Polynomials

Reminder:

Divide 7 by 3

Division Statement:

Dividend = Divisor \times Quotient + Remainder

$$7 = 3 \times 2 + 1$$

OR

Dividend = Quotient + Remainder

Divisor Divisor

$$\frac{7}{3} = 2 + \frac{1}{3}$$

Example 1: Write a division statement for:

8472 divided by 9

Long Division:

Divide: $(x^2 - 9x + 10)$ by $(x - 2)$

Compare the two leading coefficients:

1. Determine how many times x goes into x^2 . That goes on top.
2. Multiply the divisor by the top and subtract from the dividend.
3. Bring down the next value in the dividend and repeat.
4. When you can no longer divide, that is your remainder.

Examples 2:

a.) Divide: $(3x^3 - 5x + 10)$ by $(x + 2)$

b.) Divide: $(3x^4 - 5x^3 + 2x^2 - 6x + 10)$ by $(x^2 + 2)$

Synthetic Division:

1. Find the root of the divisor
2. Find the coefficients of the dividend
3. Bring down the first term
4. Multiply the outside, add the inside
5. Repeat steps 3 and 4

The last number in the bottom is the remainder, the second last is the constant and each term to the left is one degree higher.

Examples 3: Synthetically divide

a.) $(3x^3 - 5x + 10)$ by $(x + 2)$

b.) $(3x^3 - 2x^2 - 5x + 10)$ by $(x - 1)$

c.) $(x^5 - 3x^3 + 23)$ by $(x + 1)$

Note: if the divisor is not in the form $(x - a)$ then factor the divisor first

d.) $(2x^3 + 3x^2 - 5x - 10)$ by $(2x - 3)$

e.) $(x^4 + 9x^3 - 5x^2 - 36x + 4)$ by $(x^2 - 4)$

***This only works if the divisor divides evenly into the dividend (ie no remainder)