

Name: \_\_\_\_\_

Date: \_\_\_\_\_ # \_\_\_\_\_

## Section 5-4 Dividing Polynomials

**Learning Goal:** To understand how to divide polynomials by using long division and synthetic division.

**Essential Questions:** What does the degree of a polynomial tell you about its related polynomial function?  
For a polynomial function, how are factors, zeros, and x-intercepts related?  
For a polynomial equation, how are factors and roots related?

### Warm Up:

Factor:

1.  $5x^2 + 6x + 1$

2.  $2x^2 + 5x - 12$

3.  $10x^2 + 11x + 3$

4.  $3x^2 + 22x - 16$

5.  $15x^2 - 50x + 35$

6.  $10x^3 - 44x^2 + 16x$

## Vocabulary:

### Long Division

Divide by long division.

1.  $(5x^2 + 2x + 3) \div (x + 1)$

2.  $(2x^4 + 3x^3 + 5x - 1) \div (x^2 - 2x + 2)$

You Try:

3.  $(3x^2 - 29x + 56) \div (x - 7)$

4.  $(4x^3 - 2x^2 + 6x - 1) \div (2x + 3)$

5.  $(5x^4 + 14x^3 + 9x) \div (x^2 + 3x)$

6.  $(2x^4 + 2x^3 - 10x - 9) \div (x^3 + x^2 - 5)$

**Synthetic Division** – simplifies the long-division process for dividing by a linear expression  $x-a$ .

1. Write the coefficients (including zeros) of the polynomial in standard form.
2. Omit all variables and exponents
3. For the divisor, reverse the sign of  $a$  (this allows you to add instead of subtract)

7.  $(x^3 + 2x^2 - 6x - 9) \div (x - 2)$

8.  $(x^3 - 14x + 8) \div (x + 4)$

You Try:

9.  $(4x^2 + 5x - 4) \div (x + 1)$

10.  $(10x^4 + 5x^3 + 4x^2 - 9) \div (x + 1)$

11.  $(x^2 + 3) \div (x + 3)$

12.  $(x^2 - 4x + 3) \div (x - 2)$

**Remainder theorem** – provides a quick way to find remainder of a polynomial long division problem

13. Given that  $P(x) = x^5 - 3x^4 - 28x^3 + 5x + 20$ , what is  $P(-4)$ ?

**Finding Zeros**

Given one zero of the polynomial function, find the other zero?

14.  $f(x) = 9x^3 + 10x^2 - 17x - 2; -2$

You Try:

15.  $f(x) = x^3 + 11x^2 - 150x - 1512; -14$

16.  $f(x) = 2x^3 + 3x^2 - 39x - 20; 4$

Closure: How are long division and synthetic division similar? Different?

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Assignment: section 5.4 # 9,11,12,15,17,22,23,29,32,33,36,44,46,59 (14 problems)