

## GUIDED NOTES – 5.4 DIVIDING POLYNOMIALS

### LEARNING OBJECTIVES

In this section, you will:

- Use long division to divide polynomials.
- Use synthetic division to divide polynomials.

### USING LONG DIVISION TO DIVIDE POLYNOMIALS

Study the box in your textbook section titled “the Division Algorithm.”

- The Division Algorithm Theorem states that, given a polynomial dividend  $f(x)$  and a non-zero polynomial divisor  $d(x)$  where the degree of  $d(x)$  is \_\_\_\_\_  $f(x)$ , there exist unique polynomials  $q(x)$  and  $r(x)$  such that

$$f(x) = \underline{\hspace{10em}}$$

(Note that dividing both sides of this equation by  $d(x)$  gives  $\frac{f(x)}{d(x)} = q(x) + \frac{r(x)}{d(x)}$ , which is the form that shows that the result of a polynomial division is the quotient plus the remainder over the divisor.)

- Which polynomial represents the divisor?
  - Which polynomial represents the quotient?
  - Which polynomial represents the remainder?
- Write out the 7 step process for using long division to divide the polynomial by the binomial, given a polynomial and a binomial.
    - 1.
    - 2.
    - 3.
    - 4.
    - 5.
    - 6.

7.

**Try It:** Read Examples 1 and 2 in the text, then answer the following.

Divide  $16x^3 - 12x^2 + 20x - 3$  by  $4x + 5$ .

### USING SYNTHETIC DIVISION TO DIVIDE POLYNOMIALS

*Study the box in your textbook section titled “synthetic division.”*

- Synthetic division is a shortcut that can be used when the divisor is in the form \_\_\_\_\_ where \_\_\_\_\_ is a real number. In synthetic division, only the \_\_\_\_\_ are used in the division process.

**Try It:** Read Examples 3 and 4 in the text, then answer the following.

Use synthetic division to divide  $3x^4 + 18x^3 - 3x + 40$  by  $x + 7$ .

**Try It:** Read Example 6 in the text, then answer the following.

The area of a rectangle is given by  $3x^3 + 14x^2 - 23x + 6$ . The width of the rectangle is given by  $x + 6$ . Find an expression for the length of the rectangle.