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 $\text{degree of } f(x)$, there exist unique polynomials $q(x)$ and $r(x)$ such that

$$f(x) = \quad \text{polynomial expression}$$

(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.
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 $ax + b$ where $a$ is a real number. In synthetic division, only the coefficients 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.