

## Polynomial Expressions and Functions

These notes are intended as a summary of section 1.1 (p. 2 – 6) in your workbook. You should also read the section for more complete explanations and additional examples.

### Synthetic Division

Synthetic division is a method of quickly dividing a polynomial by a binomial of the form  $x - a$ . In this method, the variables are removed and only the coefficients are recorded. To see how the method works, let's look at an example.

Divide  $5x^2 + 7x - 4$  by  $x - 2$ .

$$\begin{array}{r|rrr} a = 2 & & & \\ & 5x^2 + 7x - 4 & & \\ & 5 & 7 & -4 \\ \hline & & 5 & \end{array}$$

1. Write the value of  $a$  on the left.
2. Write the coefficients of the polynomial on the right.
3. Bring down the first coefficient, 5.

$$\begin{array}{r|rrr} 2 & 5 & 7 & -4 \\ & & 10 & \\ \hline & 5 & 17 & \end{array}$$

4. Multiply  $a$  by the value you just brought down (5) and record the result (10) under the second coefficient, 7.
5. Add down the column and record the result at the bottom.

$$\begin{array}{r|rrr} 2 & 5 & 7 & -4 \\ & & 10 & 34 \\ \hline & 5 & 17 & 30 \end{array}$$

6. Multiply  $a$  by the number you just recorded and write the result under the third coefficient.
7. Add down the column and record the result at the bottom.

Let's try a few more examples.

Use synthetic division to divide  $-x + 3x^3 - 6 + 2x^2$  by  $x + 2$ . Write the division statement.

Use synthetic division to divide  $-4x^4 + 2x^2 - x - 3$  by  $x - 3$ . Write the division statement.

Use synthetic division to divide  $2x^3 + 4x^2 - 5x - 6$  by  $x + 1$ . Write the division statement.

**Example 3 (sidebar p. 6)**

Divide:  $-3x^4 + 2x^3 + 3x^2 - 4x + 5$  by  $x + 2$ . Write the division statement.

**Homework:** #4, 8, 9, 11, 12 in the exercises (p. 7 – 12). Answers on p. 13.