

# Math in Living C O L O R !!

## 2.10 Polynomials and Synthetic Division

*Intermediate Algebra: One Step at a Time, Pages 226 - 234: 3, 5*

Dr. Robert J. Rapalje, Retired  
Central Florida, USA

See Section 2.10, with explanations, examples, and exercises, coming soon!

Perform the divisions, using synthetic division .

**P. 234. #3.** 
$$\frac{2x^3 + 5x^2 + 6x - 2}{x + 3}$$

**Solution:** First write down the coefficients of the polynomial, which are 2 5 6 -2 and prepare to do synthetic division with -3.

$$\begin{array}{r|rrrr} -3 & 2 & 5 & 6 & -2 \\ & \downarrow & -6 & 3 & -27 \\ \hline & 2 & -1 & 9 & -29 \end{array}$$

Of the resulting numbers 2 -1 9 -29 , the last number -29 is the remainder. The first three numbers 2 -1 9 are the coefficients of the quotient. The quotient always begins with an exponent that is one less than the highest power of the polynomial. The quotient will therefore begin with  $2x^2$ . The quotient is  $2x^2 - 1x + 9$  , and the final answer is

$$2x^2 - x + 9 - \frac{29}{x + 3}$$

**P.234: #5.** 
$$\frac{5x^2 + x^4 - 6x - 2}{x - 2}$$

**Solution:** First you must re-write the numerator in the correct order—that is write it in descending powers of the variable, and include placeholder zeros for any terms that are missing. Notice that the highest power of  $x$  is  $x^4$ , and there is no  $x^3$  term.

$$\frac{x^4 + 0x^3 + 5x^2 - 6x - 2}{x - 2}$$

As always with synthetic division, first write down the coefficients of the polynomial, which are **1 0 5 -6 -2** and prepare to do synthetic division with **2**.

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & 5 & -6 & -2 \\ & \downarrow & 2 & 4 & 18 & 24 \\ \hline & 1 & 2 & 9 & 12 & 22 \end{array}$$

Of the resulting numbers **1 2 9 12 22**, of course the last number **22** is the remainder, and the first four numbers **1 2 9 12** are the coefficients of the quotient. Since the quotient always begins with an exponent that is one less than the highest power of the polynomial, the answer begins with  $x^3$ .

The final answer is  $x^3 + 2x^2 + 9x + 12 + \frac{22}{x - 2}$ .