Algebra 2

Ch. 6 Handout 6.3

Dividing Polynomials

You can us polynomial division to help find all the zeros of a polynomial function. Division of polynomials is similar to numerical division.

Recall that when a numerical division has a remainder of zero the divisor and quotient are both factors of the dividend.

$$\begin{array}{r|l} & 7 \\ \hline 8 & 56 \\ & -56 \\ \hline & 0 \end{array}$$

7 and 8 are factors of 56.

If numerical division leaves a nonzero remainder then neither the divisor nor the quotient is a factor of the dividend.

$$\begin{array}{r|l} & 8\ ^{2}/_{5} \\ \hline 5 & 42 \\ & -40 \\ \hline & 2 \leftarrow R \end{array}$$

neither 5 nor 8 is a factor of 42.

Division serves as a test of whether one number is a factor of another.

The same is true for polynomial division. If you divide a polynomial by one of its factors, then you get another factor. When a polynomial division leaves a zero remainder you have factored the polynomial.

$$\begin{array}{r|l} & 2x \\ \hline x & 2x^2 \\ & -2x^2 \\ \hline & 0 \end{array}$$

x and $2x$ are factors of $2x^2$

To divide polynomials other than monomials, follow the same procedure you use to divide whole numbers.

Divide $x^2 + 2x - 30$ by $x - 5$.

$$\begin{array}{r|l} & x + 7 \\ \hline x - 5 & \cancel{x^2} + 2x - 30 \\ & -\cancel{x^2} + 5x \\ \hline & 7x - 30 \\ & -7x + 35 \\ \hline & 5 \end{array}$$

$$\boxed{x+7+\frac{5}{x-5}}$$

Not factors

Determine whether x + 2 is a factor of each polynomial.

a) $x^2 + 10x + 16$

$$\begin{array}{r} x + 8 \\ x+2 \overline{) \cancel{x^2} + 10x + 16} \\ -(\cancel{x^2} + 2x) \\ \hline 8x + 16 \\ -(8x + 16) \\ \hline 0 \end{array}$$

$\boxed{x+8 \quad \text{Yes, they are factors}}$

b) $x^3 + 7x^2 - 5x - 6$

$$\begin{array}{r} x^2 + 5x - 15 \\ x+2 \overline{) \cancel{x^3} + 7x^2 - 5x - 6} \\ -(\cancel{x^3} + 2x^2) \\ \hline 5x^2 - 5x \\ -(5x^2 + 10x) \\ \hline -15x - 6 \\ +15x + 30 \\ \hline 24 \end{array}$$

$\boxed{x^2 + 5x - 15 + \frac{24}{x+2} \quad \text{Not factors}}$

Divide $x^3 + 27$ by x + 3. Check your answer.

$$
\begin{array}{r}
x^2 - 3x + 9 \\
x+3 \overline{\big) \cancel{x^3} + 0x^2 + 0x + 27} \\
-\cancel{x^3} \mp 3x^2 \\
\hline
-\cancel{3x^2} + 0x \\
+\cancel{3x^2} \pm 9x \\
\hline
9x + 27 \\
-9x \mp 27 \\
\hline
0
\end{array}
$$

$x^2 - 3x + 9$

Yes, they are factors

2. Determine whether each divisor is a factor of each dividen

a) $(2x^2-19x+24)\div(x-8)$ b) $(x^3-4x^2+3x+2)\div(x+2)$

$$
\begin{array}{r|l}
 & x^2-6x+15 \\
\hline
x+2 & x^3-4x^2+3x+2 \\
 & -(\cancel{x^3}+2x^2) \\
 & \quad -\cancel{6x^2}+3x \\
 & \quad -(-6x^2-12x) \\
 & \qquad \cancel{15x}+2 \\
 & \qquad -(15x+30) \\
 & \qquad\quad -28
\end{array}
$$

$$\boxed{x^2-6x+15+\frac{-28}{x+2}}$$

Not factors

Assignment

pgs 324-325 ~~1-12~~, 37-43

1-11 odds, 37-43