Dividing Polynomials

Dividing Polynomials is similar to long-division of numbers.

Recall:

quotient

$$\begin{array}{r} 21 \\ 6\overline{)131} \\ \underline{12} \\ 11 \\ \underline{6} \\ 5 \end{array}$$

divisor → 6, dividend ← 131, subtract, remainder ← 5

$$\underbrace{(6)}_{\text{divisor}}\underbrace{(21)}_{\text{quotient}} + \underbrace{5}_{\text{remainder}} = \underbrace{131}_{\text{dividend}}$$

"Division Statement" is a summary of your results expressed as a balanced equation.

$\boxed{\text{Dividend=Divisor x Quotient + Remainder}}$

Note: The divisor and quotient cannot be called factors because there is a remainder. To be classified as factors remainder must equal 0. Divide perfectly!!!!

Dividing Polynomials

Consider:

quotient

dividend

divisor

$$\begin{array}{r} 2x - 7 \\ (x+2)\overline{)\,2x^2 - 3x - 1} \\ \text{subt} \quad 2x^2 + 4x \\ \hline -7x - 1 \\ \text{subt} \quad -7x - 14 \\ \hline 13 \end{array}$$

remainder

(divisor)(quotient) + remainder = dividend

$(x+2)(2x-7) + 13 = 2x^2 - 3x - 1$

Note: Degree of dividend must be greater than that of divisor for division to be possible

Complete division statement for:

a) divisor $(x+4)\overline{)x^3-7x+8}$ dividend

$$
\begin{array}{r l}
 & x^2 - 4x + 9 \\
(x+4) & \overline{)\,x^3 + 0x^2 - 7x + 8} \\
\text{subt} & \underline{x^3 + 4x^2} \\
 & -4x^2 - 7x \\
\text{subt} & \underline{-4x^2 - 16x} \\
 & 9x + 8 \\
\text{subt} & \underline{9x + 36} \\
 & -28
\end{array}
$$

remainder

divisor quotient remainder dividend

$(x+4)(x^2-4x+9)-28 = x^3-7x+8$

Note: the dividend & divisor must be arranged in correct order (descending degrees) with no terms missing (place zeros as place holders)

b) $\dfrac{18x - 22 + 6x^3 - 19x^2}{2x - 5}$

$$
\begin{array}{r|llll}
 & 3x^2 & -2x & +4 & \\
\hline
2x-5 & 6x^3 & -19x^2 & +18x & -22 \\
 & 6x^3 & -15x^2 & & \\
\hline
 & & -4x^2 & +18x & \\
 & & -4x^2 & +10x & \\
\hline
 & & & 8x & -22 \\
 & & & 8x & -20 \\
\hline
 & & & & -2 \text{ Remainder}
\end{array}
$$

c) $(x^2-4)\overline{)x^4-15x^3+2x^2+12x-10}$

$$\begin{array}{r} x^2-15x+6 \\ x^2+0x-4\overline{)x^4-15x^3+2x^2+12x-10} \\ \underline{x^4+0x^3-4x^2} \\ -15x^3+6x^2+12x \\ \underline{-15x^3+0x^2+60x} \\ 6x^2-48x-10 \\ \underline{6x^2+0x-24} \\ -48x+14 \end{array}$$

subst

Remainder

Hwk: pg 168-169 #2-5