Math 1010 6.6 Division of Polynomials

1. Dividing by a Monomial

MONOMIAL = ONE TERM

Ex 1 Divide $12x^3+8x^2+x+4$ by $4x$

$12x^3+8x^2+x+4$: 4 TERMS, POLYNOMIAL

$4x$: ONE TERM, MONOMIAL

$$\frac{A+B}{C}=\frac{A}{C}+\frac{B}{C}$$

$$\frac{12x^3+8x^2+x+4}{4x}=\frac{12x^3}{4x^1}+\frac{8x^2}{4x^1}+\frac{1}{4x}+\frac{4}{4x}$$

$$=3x^2+2x+\frac{1}{4}+\frac{1}{x}$$

Ex 2 Divide $(8x^4y^5-3x^3y^4+5x^2y^3)\div(-x^2y^3)$

$-x^2y^3$: MONOMIAL

$$\frac{8x^4y^5}{-x^2y^3}+\frac{-3x^3y^4}{-x^2y^3}+\frac{5x^2y^3}{-x^2y^3}$$

$$-8x^2y^2+3xy-5$$

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$$=\boxed{3x^2+2x+\frac{1}{4}+\frac{1}{x}}$$

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$-x^2y^3$: MONOMIAL

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Divide by Polynomials

EXAMPLE DIVIDE $2x^2 - 7x - 15$ by $x - 5$

TWO TERMS
NOT MONOMIAL
BINOMIAL
POLYNOMIAL

LONG DIVISION

$$\begin{array}{r} 2x + 3 \\ x - 5 \overline{)\, 2x^2 - 7x - 15} \\ -2x^2 \pm 10x \quad\quad \\ \hline 3x - 15 \\ -3x \pm 15 \\ \hline 0 \end{array}$$

$2x + 3$

PHRASES

X TIMES WHAT IS $2x^2$?

BRAIN: $2x$

WORK $\frac{2x^2}{x} = 2x$

DRAW LINE, CHANGE SIGNS

$\frac{3x}{x} = 3 \rightarrow +3$

Remainder

NOT MONOMIAL

Ex. Divide x^2+5x+8 by $x+3$

$$x+3 \;\overline{)\; x^2+5x+8}$$

$x+2$

$-(x^2+3x)$

$2x+8$

$-(2x+6)$

$+2$ ← NONZERO REMAINDER

$$x+2+\frac{2}{x+3} \qquad \frac{\text{REMAINDER}}{\text{DIVISOR}}$$

Place holders

$x^3+9x^2-5 \rightarrow$ MISSING X TERM

$x^5+x^3+2x^2+4x^0 \rightarrow$ MISSING x^4, CONSTANT TERM

Ex $(x^3 - x + 6) \div (x+2)$ ← NOT MONOMIAL

↙ x^2 term missing

$$x+2 \;\overline{)\; x^3 + 0x^2 - x + 6}$$

$x^2 - 2x + 3$

$-x^3 \mp 2x^2$

$-2x^2 - x$

$\pm 2x^2 \pm 4x$

$3x + 6$

$-3x \mp 6$

0

$$x^2 - 2x + 3$$

NOT MONOMIAL

ORDER TERMS. DESCENDING

Ex DIVIDE $(3x^2 - x + 2x^3 - 3) \div (2 + x)$

$2x^3 + 3x^2 - x - 3$

$-2x^3 \mp 4x^2$

$-x^2 - x$

$\pm x^2 \pm 2x$

$-x - 3$

$\mp x \mp 2$

-5

$$2x^2 - x + 1 + \frac{-5}{x+2}$$