Homework Qs

Note Title 3/17/2015

4.7 #56 $\dfrac{(x-3)^2-(x+3)^2}{3x}$ Simplify numerator, then divide.

$$= \frac{(x-3)(x-3)-(x+3)(x+3)}{3x} = \frac{x^2-3x-3x+9-(x^2+3x+3x+9)}{3x}$$

$$= \frac{x^2-6x+9-(x^2+6x+9)}{3x} = \frac{x^2-6x+9-x^2-6x-9}{3x}$$

$$= \frac{-12x}{3x} = \boxed{-4}$$

Example (from 4.7) Divide.

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

Only 1 term in divisor, so break into separate fractions.

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

$$= \boxed{1 - \frac{4}{x} + \frac{5}{2x^2} - \frac{3}{2x^3}}$$

4.8: Polynomial Long Division

Example: Divide $\dfrac{8x^3-10x^2+x-2}{2x-1}$

$\frac{8x^3}{2x}$ $\frac{-6x^2}{2x}$ $\frac{-2x}{2x}$

$$4x^2 - 3x - 1$$
$$2x-1 \overline{)\, 8x^3 - 10x^2 + x - 2}$$
$$\pm(\mp 8x^3 \pm 4x^2)$$
$$-6x^2 + x$$
$$\pm(\mp 6x^2 \mp 3x)$$
$$-2x - 2$$
$$\pm(\mp 2x \mp 1)$$
$$-3$$

Write your answer: $\dfrac{8x^3-10x^2+x-2}{2x-1} = 4x^2 - 3x - 1 + \dfrac{-3}{2x-1}$

usually written: $4x^2 - 3x - 1 - \dfrac{3}{2x-1}$

Check your answer: $(2x-1)(4x^2-3x-1) - 3$

$= 8x^3 - 6x^2 - 2x$
$\quad - 4x^2 + 3x + 1 - 3$

$= 8x^3 - 10x^2 + x - 2$ ✓ same as original numerator/dividend

Important: Arrange terms in order, starting with largest exponent

✱ Insert "placeholders" for missing powers of x (example: $0x^3$ or $0x^2$ or $0x$)

Example: Divide. $\dfrac{3x^4 - 50x^2 - x}{x - 4}$

$$
\begin{array}{r}
3x^3 + 12x^2 - 2x - 9 \\
x - 4 \overline{)\,3x^4 + 0x^3 - 50x^2 - x + 0} \\
\underline{\mp(3x^4 \pm 12x^3)} \\
12x^3 - 50x^2 \\
\underline{\pm(12x^3 \mp 48x^2)} \\
-2x^2 - x \\
\underline{\mp(-2x^2 \pm 8x)} \\
-9x + 0 \\
\underline{\pm(-9x \mp 36)} \\
-36
\end{array}
$$

Write answer:

$$\frac{3x^4 - 50x^2 - x}{x - 4} = 3x^3 + 12x^2 - 2x - 9 + \frac{-36}{x - 4}$$

Check: $(x-4)(3x^3 + 12x^2 - 2x - 9) - 36$

$= 3x^4 + 12x^3 - 2x^2 - 9x$

$\quad -12x^3 - 48x^2 + 8x + 36 - 36$

$= 3x^4 - 50x^2 - x$ ✓ ok

Example: $\frac{2x^3 - 77x - 12}{x+6}$ Divide.

See notes from 5:30 Class.

Example: Divide. $\dfrac{10x^3+21x^2-5}{2x^2+5x+2}$

$$
\begin{array}{r}
5x-2 \\
2x^2+5x+2 \overline{)\,10x^3+21x^2+0x-5} \\
\pm(\mp 10x^3 \mp 25x^2 \mp 10x) \\
\hline
-4x^2-10x-5 \\
\pm(\pm 4x^2 \pm 10x \pm 4) \\
\hline
-1
\end{array}
$$

Write answer: $\dfrac{10x^3+21x^2-5}{2x^2+5x+2} = 5x-2+\dfrac{-1}{2x^2+5x+2}$