

38.4. Polynomial Division

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Recall:

$$\begin{array}{r} 17 \\ 5 \overline{) 87} \\ \underline{5} \\ 37 \\ \underline{35} \\ 2 \end{array}$$

$\frac{87}{5} = 17 \frac{2}{5}$

Example #1. Calculate

(a) $\frac{8x^3 - 10x^2 - 73x - 60}{x - 4} = f(x)$

(b) $\frac{21x^3 + 26x^2 + x - 4}{x + 8} = g(x)$

Solution:

(a) $x - 4 \overline{) 8x^3 - 10x^2 - 73x - 60}$

$$\begin{array}{r} 8x^2 + 22x + 15 \\ x - 4 \overline{) 8x^3 - 10x^2 - 73x - 60} \\ \underline{-8x^3 + 32x^2} \\ 22x^2 - 73x - 60 \\ \underline{-22x^2 + 88x} \\ 15x - 60 \\ \underline{-15x + 60} \\ 0 \end{array}$$

$f(x) = 8x^2 + 22x + 15$

(b) $x + 8 \overline{) 21x^3 + 26x^2 + x - 4}$

$$\begin{array}{r} 21x^2 - 142x + 1137 \\ x + 8 \overline{) 21x^3 + 26x^2 + x - 4} \\ \underline{-21x^3 - 168x^2} \\ -142x^2 + x - 4 \\ \underline{142x^2 + 1136x} \\ 1137x - 4 \\ \underline{-1137x - 9096} \\ -9100 \end{array}$$

$g(x) = 21x^2 - 142x + 1137 - \frac{9100}{x + 8}$

Example #2. Calculate the divisions in Example #1 using Synthetic Division.

Solution:

(a) $\begin{array}{c|cccc} 4 & 8 & -10 & -73 & -60 \\ & & 32 & 88 & 60 \\ \hline & 8 & 22 & 15 & 0 \end{array}$

$f(x) = 8x^2 + 22x + 15$

(b) $\begin{array}{c|cccc} -8 & 21 & 26 & 1 & -4 \\ & & -168 & 1136 & -9096 \\ \hline & 21 & -142 & 1137 & -9100 \end{array}$

$g(x) = 21x^2 - 142x + 1137 - \frac{9100}{x + 8}$