

F & T
Long Division/Synthetic Division

Name _____

When you divide a polynomial $f(x)$ by a divisor $d(x)$, you get a quotient polynomial $q(x)$ and a remainder polynomial $r(x)$.

$$\frac{f(x)}{d(x)} = q(x) + \frac{r(x)}{d(x)}$$

1.) Divide $3 \overline{)125}$ and write the quotient as a mixed number.

$$\begin{array}{r} 41 \\ -12 \downarrow \\ \hline 05 \\ -3 \\ \hline 2 \end{array} \quad 41 \text{ R } 2 \quad \text{or} \quad 41 \frac{2}{3}$$

Long Division

2.) Divide $f(x) = x^3 - 5x^2 + 3x - 2$ by $x + 1$ and write your answer in $q(x) + \frac{r(x)}{d(x)}$ form.

$$\begin{array}{r} x^2 - 6x + 9 \\ x+1 \overline{) x^3 - 5x^2 + 3x - 2} \\ \underline{-(x^3 + x^2)} \downarrow \\ -6x^2 + 3x \\ \underline{-(-6x^2 - 6x)} \downarrow \\ 9x - 2 \\ \underline{-(9x + 9)} \\ -11 \end{array} \quad x^2 - 6x + 9 + \frac{-11}{x+1}$$

Synthetic Division

3.) Divide $f(x) = x^3 - 5x^2 + 3x - 2$ by $x + 1$ and write your answer in $q(x) + \frac{r(x)}{d(x)}$ form.

$$\begin{array}{r|rrrr} -1 & 1 & -5 & 3 & -2 \\ & \downarrow & -1 & 6 & -9 \\ \hline & 1 & -6 & 9 & -11 \end{array}$$

$$x^2 - 6x + 9 + \frac{-11}{x+1}$$

4.) Write the expression $\frac{2x^4 - 3x^2 - 15}{x+2}$ in $q(x) + \frac{r(x)}{d(x)}$ form.

$$\begin{array}{r|rrrrr} -2 & 2 & 0 & -3 & 0 & -15 \\ & \downarrow & -4 & 8 & -10 & 20 \\ \hline & 2 & -4 & 5 & -10 & 5 \end{array}$$

$$2x^3 - 4x^2 + 5x - 10 + \frac{5}{x+2}$$

5.) Write the expression $\frac{8x^2 + 34x - 1}{4x - 1}$ in $q(x) + \frac{r(x)}{d(x)}$ form.

$$\begin{array}{r|rr} \frac{1}{4} & 8 & 34 & -1 \\ & \downarrow & 2 & 9 \\ \hline & 8 & 36 & 8 \end{array}$$

Divide by 4

$$\begin{array}{r|rr} & 2 & 9 & 2 \end{array}$$

$$2x + 9 + \frac{8}{4x-1}$$

$$4x - 1 = 0$$

$$4x = 1$$

$$x = \frac{1}{4}$$