

Polynomial Division

Long Division

Synthetic Division

Dividing Polynomials

Long Division

Example: Find the quotient, remainder, and summary statement in fraction form when $2x^3 + 4x^2 + x - 3$ by $x - 1$

$$\begin{array}{r}
 2x^2 + 6x + 7 + \frac{4}{x-1} \\
 x-1 \overline{) 2x^3 + 4x^2 + x - 3} \\
 \underline{-2x^3 + 2x^2} \\
 6x^2 + x \\
 \underline{-6x^2 + 6x} \\
 7x - 3 \\
 \underline{-7x + 7} \\
 4 \leftarrow R
 \end{array}$$

$\frac{2x^3}{x} = 2x^2$
 $\frac{6x^2}{x} = 6x$
 $\frac{7x}{x} = 7$

Steps

- 1) Set up the division problem.
- 2) Divide the leading term of the dividend (what you're dividing into) by leading term of the divisor (what you're dividing by).
 $\frac{1st \text{ term inside}}{1st \text{ term outside}}$
- 3) Write down the calculated result above the division symbol. This is the 1st term of the quotient. *write it on top*
- 4) **MULTIPLY** the 1st term of the quotient with every term in the divisor (what you're dividing by).
 $2x^2(x-1)$
- 5) **SUBTRACT** the whole quantity. *"Draw the line + change the signs"*
- 6) Bring down the next term of the dividend.
- 7) Repeat until you find the remainder.
 $\frac{\text{remainder}}{\text{divisor}}$

Synthetic Division ★ you can only use this method when dividing by a linear binomial with leading coefficient of 1

Example: Find the quotient, remainder, and summary statement in fraction form when $2x^3 + 4x^2 + x - 3$ by $x - 1$

$$\begin{array}{r|rrrr}
 & x^3 & x^2 & & \\
 1 & 2 & 4 & 1 & -3 \\
 & \downarrow & 2 & 6 & 7 \\
 \hline
 & 2 & 6 & 7 & 4
 \end{array}$$

mult.
 remainder
 Put variables back in with exponents 1 degree lower than problem!
 $2x^2 + 6x + 7 + \frac{4}{x-1}$

Steps

- 1) Set up an upside down division symbol and write out the coefficients and constant of the dividend. If a term is missing put a ZERO in its place.
- 2) Set the divisor equal to zero and solve for x . Place this number outside the division symbol $x-1=0$
 $x=1 \leftarrow$ outside
- 3) **BRING DOWN** the leading coefficient of the dividend below the line.
- 4) **MULTIPLY** this number by the number in front and place it underneath the next dividend coefficient.
- 5) **ADD** the numbers in the column and continue this process until done