

6.2 Dividing Polynomials

Case 2: Polynomial \div Linear Binomial

Example:
$$\frac{2x^3 - 5x^2 + 3x + 7}{x - 2}$$

Use Synthetic Division

$$\begin{array}{r} x - 2 = 0 \\ +2 \quad +2 \\ \hline x = 2 \end{array}$$

① set denominator equal to zero & solve for x.

$$2x^3 - 5x^2 + 3x + 7$$

② Make sure your numerator is in standard form & write its coefficients in order.

③ Bring answer from step 1 to "division box"

$$\begin{array}{r|rrrr} 2 & 2 & -5 & 3 & 7 \\ & \downarrow & & & \\ \hline & 2 & -1 & 1 & 9 \end{array}$$

④ Bring down 1st #.

⑤ Multiply & add remainder all the way across.

Answer: $2x^2 - 1x + 1 + \frac{9}{x-2}$

Ex. 2:
$$\frac{x^3 - 5x^2 + 3x + 7}{x - 3} \quad \text{Ans: } 1x^2 - 2x - 3 + \frac{-2}{x-3}$$

$$x - 3 = 0$$

$$x = 3$$

$$\begin{array}{r|rrrr} 3 & 1 & -5 & 3 & 7 \\ & \downarrow & & & \\ \hline & 1 & -2 & -3 & -2 \text{ R} \end{array}$$

$$\underline{YT} : \frac{x^3 + 5x^2 - 14x - 21}{x - 3}$$

$$\text{Ans: } 1x^2 + 8x + 10 + \frac{9}{x-3}$$

Sometimes, the numerator is missing terms so you must placeholder them with a zero.

$$\text{Example: } \frac{3x^3 + 5x - 1}{x + 1}$$

$$\begin{aligned} x+1 &= 0 \\ -1 & -1 \\ x &= -1 \end{aligned}$$

	x^3	x^2	x	#
-1	3	0	5	-1
↓		-3	3	-8
	3	-3	8	-9R

$$3x^2 - 3x + 8 + \frac{-9}{x+1}$$

SIDE NOTE

$$\frac{x^4}{x} \frac{\text{quartic}}{\text{linear}} = \text{cubic } x^3$$

$$\frac{x^3}{x} \frac{\text{cubic}}{\text{linear}} = \text{quadratic } x^2$$

$$\frac{x^2}{x} \frac{\text{quadratic}}{\text{linear}} = \text{linear } x$$