

6.6 SYNTHETIC Division only works when dividing by $(x - k)$

1. $(y^3 + 5y^2 - 7y + 2) \div (y - 2)$

$\curvearrowright k$

$k \rightarrow$

$$\begin{array}{r|rrrr} 2 & 1 & 5 & -7 & 2 \\ & & +2 & +4 & 14 \\ \hline & 1 & 7 & 7 & 16 \end{array}$$

coefficients of dividend

1×2 7×2 remainder

$$y^2 + 7y + 7 + \frac{16}{y-2}$$

2. $(5x^3 + 12x^2 - 5x - 6) \div (x + 3)$

$\curvearrowright k = -3$

$$\begin{array}{r|rrrr} -3 & 5 & 12 & -5 & -6 \\ & & -15 & 9 & -12 \\ \hline & 5 & -3 & 4 & -18 \end{array}$$

$5 \times (-3)$

$$5x^2 - 3x + 4 + \frac{-18}{x+3}$$

3. $(k^3 - 17k + 32) \div (k + 5)$

OK² term

$$\begin{array}{r|rrrr} -5 & 1 & 0 & -17 & 32 \\ & & -5 & 25 & -40 \\ \hline & 1 & -5 & 8 & -8 \end{array}$$

$$k^2 - 5k + 8 + \frac{-8}{k+5}$$

Long or Synthetic

4. $6x^3 + 7x^2 - 1 \div (2x + 1)$

- Can use synthetic if divisor is written as $x + \frac{1}{2}$.
- can use long division as written.

$$\begin{array}{r|rrrr}
 -\frac{1}{2} & 6 & 7 & 0 & -1 \\
 & & -3 & -2 & 1 \\
 \hline
 & 6 & 4 & -2 & 0 \\
 & & & & \uparrow \\
 & & & & \text{no remainder}
 \end{array}$$

Divide by 2
3 2 -1

$3x^2 + 2x - 1$

5. $(8x^4 - 64x^3 + 3x - 28) \div (x^2 - 8)$

cannot use synthetic
Divisor cannot be written in $(x - k)$

$$\begin{array}{r}
 2x+1 \overline{) \begin{array}{r} 6x^3 + 7x^2 + 0x - 1 \\ -(6x^3 + 3x^2) \\ \hline 4x^2 + 0x \\ -(4x^2 + 2x) \\ \hline -2x - 1 \\ -(-2x - 1) \\ \hline 0 \end{array} }
 \end{array}$$