

## 5-2B Synthetic Division

- Use synthetic division to divide polynomials by binomials

### Dividing by synthetic division

- easier, shorter method than long division.
- used with a binomial divisor,  $(x - r)$
- coefficient of  $x$  **MUST BE 1**.

$$\begin{aligned} &(x-2), r=2 \\ &(x+3), r=-3 \\ &(x-(-3)) \end{aligned}$$

$$\begin{aligned} &\frac{(\quad)}{(x^2+5)} \\ &\frac{(\quad)}{(x^2+5x-7)} \\ &(x-h)^2+k \end{aligned}$$

1. Divide  $x^4 - 2x^3 + x^2 - 3x + 2$  by  $(x-2)$   $r=2$

$$\begin{array}{r|rrrrr} 2 & 1 & -2 & 1 & -3 & 2 \\ & & +2 & +0 & +2 & -2 \\ \hline & 1 & 0 & 1 & -1 & 0 \end{array}$$

$x^3 + 0x^2 + 1x - 1$       (remainder)  $0$

$$2. \frac{(2x^3 - 5x^2 + 4x - 4)(x-1)}{(x+2)^1} \quad R = -2$$

$$\begin{array}{r} -2 \overline{) 2 \quad -5 \quad 4 \quad -4} \\ \underline{\downarrow \quad -4 \quad 18 \quad -44} \\ 2 \quad -9 \quad 22 \quad -48 \end{array}$$

$$\boxed{2x^2 - 9x + 22 \quad \frac{-48}{x+2}}$$

$$3. \frac{y^3 - y^2 + 6}{y+2}$$

$$\begin{array}{r} -2 \overline{) 1 \quad -1 \quad 0 \quad -6} \\ \underline{\downarrow \quad -2 \quad 6 \quad -12} \\ 1 \quad -3 \quad 6 \quad -18 \end{array}$$

$$\boxed{y^2 - 3y + 6 \quad \frac{-18}{y+2}}$$

4.  $(x^3 - x^2 + 2x - 7) \div (2x - 1)$   ~~$\div (2x - 1)$~~   $\div 2(x - \frac{1}{2})$

coefficient of variable is not 1.

$$\frac{\frac{1}{2}x^3 - \frac{1}{2}x^2 + \phantom{0}x - \frac{7}{2}}{\frac{1}{2}x - \frac{1}{2}}$$

$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$8$	$-7 \cdot 8 = -56$
	$\downarrow$	$\frac{1}{4}$	$-\frac{1}{8}$	$\frac{7}{16}$
$\frac{1}{2}$	$-\frac{1}{4}$	$\frac{7}{8}$	$\left. \begin{matrix} -49 \\ 16 \end{matrix} \right\}$	$\frac{7}{16}$

$\frac{1}{2}$   
 $\frac{7}{8}$

$$\frac{1}{2}x^2 - \frac{1}{4}x + \frac{7}{8} \quad \frac{-49}{16x - 8}$$

$$\frac{-49}{16} \cdot \frac{16}{1} = \frac{-49}{16x - 8}$$

