

①  $\frac{2x^3 - 3x^2 - 5x - 12}{x-3}$

$$\begin{array}{r|rrrr} 3 & 2 & -3 & -5 & -12 \\ & & 6 & 9 & 12 \\ \hline & 2 & 3 & 4 & 0 \end{array}$$

$(2x^2 + 3x + 4)(x-3)$

②  $\frac{2x^4 - 5x^3 + 7x^2 - 3x + 1}{x-3}$

$$\begin{array}{r|rrrrr} 3 & 2 & -5 & 7 & -3 & 1 \\ & & 6 & 3 & 30 & 81 \\ \hline & 2 & 1 & 10 & 27 & 82 \end{array}$$

①  $2x^3 + x^2 + 10x + 27 + \frac{82}{x-3}$

$(x-3)(2x^3 + x^2 + 10x + 27) + 82$

### Factor Polynomials

1. Use the Calc to Find the real rational zero(s).
2. Use Synthetic Division to "Factor" out the zero
3. Factor completely.

### Example

①  $f(x) = 6x^3 + 17x^2 - 33x - 20$

$x = -4$

$(x+4)(6x^2 - 7x - 5)$

$$\begin{array}{r|rrrr} -4 & 6 & 17 & -33 & -20 \\ & & -24 & 28 & 20 \\ \hline & 6 & -7 & -5 & 0 \end{array}$$

$(x+4)(2x+1)(3x-5)$

### Ex 2

$g(x) = 2x^4 + 7x^3 - 7x^2 - 35x - 15$   
 $(2x^2 - 10)$

$x = -3, -0.5$   $(x+3)(2x+1)(x+\sqrt{5})(x-\sqrt{5})$

$2x^2 - 10 = 0$

$$\begin{array}{r}
 -3 \overline{) 2 \ 7 \ -7 \ -35 \ -15} \\
 \underline{-6 \ -3 \ 30 \ 15} \\
 -\frac{1}{2} \overline{) 2 \ 1 \ -10 \ -5 \ | \ 0} \\
 \underline{-1 \ 0 \ 5} \\
 2 \ 0 \ -10 \ | \ 0
 \end{array}$$

$$\begin{aligned}
 &\xrightarrow{c} x^2 = 10 \\
 &x^2 = 5 \\
 &x = \pm\sqrt{5}
 \end{aligned}$$

$$g(x) = 2(x+3)(2x+1)(x+\sqrt{5})(x-\sqrt{5})$$

Ex 3

$$\begin{aligned}
 h(x) &= x^4 - 4x^3 - 3x^2 + 12x \\
 &= x(x^3 - 4x^2 - 3x + 12)
 \end{aligned}$$

"D.O.T.S"

$$\begin{array}{r}
 4 \overline{) 1 \ -4 \ -3 \ 12} \\
 \underline{4 \ 0 \ -12} \\
 1 \ 0 \ -3 \ | \ 0
 \end{array}$$

$$h(x) = x(x-4)(x^2-3)$$

$$h(x) = x(x-4)(x+\sqrt{3})(x-\sqrt{3})$$

$$4x^2 - 3$$

$$(2x+\sqrt{3})(2x-\sqrt{3})$$