

#39

$$x^5 + 4x^4 - 13x^3 - 52x^2 + 36x + 144$$

$$\begin{array}{r|rrrrrrr} 2 & 1 & 4 & -13 & -52 & 36 & 144 \\ & & 2 & 12 & -2 & -108 & -144 \\ \hline & 1x^4 & 6x^3 & -1x^2 & -54x & -72 & 0 \end{array}$$

$$(x-2)(x^4 + 6x^3 - x^2 - 54x - 72)$$

$$\begin{array}{r|rrrrr} 2 & 1 & 6 & -1 & -54 & -72 \\ & & 2 & 16 & 30 & -48 \\ \hline & 1 & 8 & 15 & -24 & 0 \end{array}$$

$$\begin{array}{r|rrrrr} -2 & 1 & 6 & -1 & -54 & -72 \\ & & -2 & -8 & 18 & 72 \\ \hline & 1x^3 & 4x^2 & -9x & -36 & 0 \end{array}$$

$$(x-2)(x+2)(x^3 + 4x^2 - 9x - 36)$$

$$x^3 + 4x^2 - 9x - 36$$

$$x^2(x+4) - 9(x+4)$$

$$(x+4)(x^2-9)$$

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

zeros: $\pm 2, \pm 3, -4$

Practice Factor

$$\textcircled{1} \quad \begin{array}{c} 5^2 - (3x)^2 \\ 25 - 9x^2 \end{array} = (5 - 3x)(5 + 3x)$$

$$\textcircled{2} \quad \begin{array}{c} 3^3 - (2x)^3 \\ 27 - 8x^3 \end{array} = (3 - 2x)(9 + 6x + 4x^2)$$

$$\textcircled{3} \quad \begin{array}{c} (5x)^3 + 1^3 \\ 125x^3 + 1 \end{array} = (5x + 1)(25x^2 - 5x + 1)$$

$$\textcircled{4} \quad \text{Factor by grouping: } x^5 - x^3 - x^2 + 1$$

$$x^3(x^2 - 1) - 1(x^2 - 1)$$

$$(x^2 - 1)(x^3 - 1)$$

$$\begin{array}{ccc} \downarrow & & \searrow \\ (x+1)(x-1) & \cdot & (x-1)(x^2+x+1) \end{array}$$

Quiz 8/30

Factor

① $64 - 25x^2$

② $x^3 + 8$

③ $27x^3 - 125$

④ $x^4 - 13x^2 + 36$ (Hint: first factor into 2 binomials)