

HW answers 8/27/2018 pch

$$\textcircled{\#1} \quad x^4 - 10x^2 + 9 = 0$$

$$(x^2 - 9)(x^2 - 1) = 0$$

$$(x-3)(x+3)(x-1)(x+1) = 0$$

Zeros: $\pm 3, \pm 1$

$$\textcircled{\#3} \quad x^5 - x^3 = 0$$

$$x^3(x^2 - 1) = 0$$

$$x^3(x-1)(x+1) = 0$$

Zeros: $0, \pm 1$

$$\textcircled{\#5} \quad x^3 + 27 = 0 \quad \text{sum of cubes}$$

$$(x+3)(x^2 - 3x + 9) = 0$$

$$\boxed{x = -3} \quad x = \frac{3 \pm \sqrt{9 - 36}}{2} = \frac{3 \pm \sqrt{-27}}{2}$$

Zeros \rightarrow $\boxed{x = \frac{3 \pm 3i\sqrt{3}}{2}}$

$$\textcircled{\#7} \quad 3x^5 + 24x^2 = 0$$

$$3x^2(x^3 + 8) = 0 \quad \text{sum of cubes}$$

$$3x^2(x+2)(x^2 - 2x + 4) = 0$$

$$\boxed{x=0} \quad \boxed{x=-2} \quad x = \frac{2 \pm \sqrt{4-16}}{2}$$

$$x = \frac{2 \pm \sqrt{-12}}{2} = \frac{2 \pm 2i\sqrt{3}}{2}$$

zeros

$$\boxed{x = 1 \pm \sqrt{3}i}$$

$$\textcircled{\#9} \quad x^4 - 8x^2 + 16 = 0$$

$$(x^2 - 4)(x^2 - 4) = 0$$

$$(x-2)(x+2)(x-2)(x+2) = 0$$

$$\boxed{x = \pm 2} \quad \text{zeros}$$

$$\textcircled{\#11} \quad x^3 - 2x^2 - x + 2 = 0 \quad \text{factor by grouping}$$

$$x^2(x-2) - (x-2) = 0$$

$$(x-2)(x^2-1) = 0$$

$$(x-2)(x-1)(x+1) = 0$$

$$\boxed{\text{zeros: } 2, \pm 1}$$

#13) $x^3 - 4x^2 - 25x + 100 = 0$

$$x^2(x-4) - 25(x-4) = 0$$

$$(x-4)(x^2-25) = 0$$

$$(x-4)(x-5)(x+5) = 0$$

factor
by
grouping

zeros: $4, \pm 5$

#15) $x^4 + 2x^3 + 8x + 16 = 0$

$$x^3(x+2) + 8(x+2) = 0 \quad \text{grouping}$$

$$(x+2)(x^3+8) = 0 \quad \text{sum of cubes}$$

$$(x+2)(x+2)(x^2-2x+4) = 0$$

$x = -2$

double
root

$$x = \frac{2 \pm \sqrt{4-16}}{2} = \frac{2 \pm 2i\sqrt{3}}{2}$$

zeros

$x = 1 \pm i\sqrt{3}$

$$\textcircled{17} \quad x^4 - x^3 - 27x + 27 = 0 \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{grouping}$$

$$x^3(x-1) - 27(x-1) = 0$$

$$(x-1)(x^3 - 27) = 0 \quad \text{diff of cubes}$$

$$(x-1)(x-3)(x^2 + 3x + 9) = 0$$

$$\boxed{x=1} \quad \boxed{x=3} \quad x = \frac{-3 \pm \sqrt{9-36}}{2}$$

$$\text{zeros} \rightarrow \boxed{x = \frac{-3 \pm 3i\sqrt{3}}{2}}$$

$$\textcircled{19} \quad 2x^3 + x^2 - 18x - 9 = 0 \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{grouping}$$

$$x^2(2x+1) - 9(2x+1) = 0$$

$$(2x+1)(x^2 - 9) = 0 \quad \text{diff of squares}$$

$$(2x+1)(x-3)(x+3) = 0$$

$$\boxed{x = -\frac{1}{2}} \quad \boxed{x = \pm 3} \quad \leftarrow \text{zeros}$$

#34

$$x^3 + 17x^2 + 95x + 175$$

$$\begin{array}{l} 175 \\ \hat{5} \cdot 35 \\ \hat{5} \cdot \hat{5} \cdot 7 \end{array}$$

guess and check to find zeros

possible rational zeros: $\pm 1, \pm 5, \pm 7, \pm 25, \pm 35, \pm 175$

(NOTICE that since all the coefficients are positive, you can't possibly get 0 by plugging in a positive number.)

$$\begin{array}{r|rrrr} -11 & 1 & 17 & 95 & 175 \\ & & -1 & -16 & 79 \\ \hline & 1 & 16 & 79 & \end{array}$$

$$\begin{array}{r|rrrr} -5 & 1 & 17 & 95 & 175 \\ & & -5 & -60 & -175 \\ \hline & 1 & 12 & 35 & 0 \end{array}$$

$$(x+5)(x^2 + 12x + 35) = 0$$

$$(x+5)(x+5)(x+7) = 0$$

$$\boxed{x = -5}$$

$$\boxed{x = -7}$$

double
root

$$\boxed{37} \quad x^4 - 2x^3 - 35x^2 + 72x - 36$$

$$\begin{array}{r|rrrrr} \Downarrow & 1 & -2 & -35 & +72 & -36 \\ & & 1 & -1 & -36 & 36 \\ \hline & 1 & -1 & -36 & 36 & 0 \end{array}$$

$$\begin{array}{r|rrrr} \Downarrow & 1 & -1 & -36 & 36 \\ & & 1 & 0 & -36 \\ \hline & 1 & 0 & -36 & 0 \end{array}$$

$$(x-1)(x-1)(x^2-36) = 0$$

$$(x-1)(x-1)(x-6)(x+6) = 0$$

$$\boxed{x=1}$$

double
root

$$\boxed{x = \pm 6}$$