

Find All Real, Irrational, or Imaginary Zeroes. Categorize each Polynomial by Degree and # Terms.

If Multiplicity >1 then identify.

1. $P(x) = x^3 - x^2 - 2x + 2$

List all Possible Real Roots: $\pm 1, 2$

$$\begin{array}{r|rrrr} 1 & 1 & -1 & -2 & 2 \\ & & 1 & 0 & -2 \\ \hline & 1 & 0 & -2 & 0 \end{array} \begin{array}{l} R \\ \\ \\ \end{array}$$

$x^2 \quad x \quad c$

$$\begin{array}{l} x = 1 \\ x = \pm\sqrt{2} \end{array}$$

Degree Cubic
Terms polynomial of 4 terms

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

$$\begin{array}{r} x^2 - 2 = 0 \\ +2 \quad +2 \end{array} \Rightarrow \sqrt{x^2} = \sqrt{2} \\ x = \pm\sqrt{2}$$

2. $Q(x) = x^4 - 6x^2 - 7$

$$x^4 - 6x^2 - 7 = 0$$

$$(x^2 - 7)(x^2 + 1) = 0$$

$$\begin{array}{r} x^2 - 7 = 0 \\ +7 \quad +7 \end{array} \quad \begin{array}{r} x^2 + 1 = 0 \\ -1 \quad -1 \end{array}$$

$$\sqrt{x^2} = \sqrt{7} \quad \sqrt{x^2} = \sqrt{-1}$$

$$\boxed{x = \pm\sqrt{7} \quad x = \pm i}$$

Degree quartic
Terms trinomial

3. $Z(x) = x^4 + x^3 - 9x^2 - 9x$ GCF: x

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

$$\boxed{x = 0}$$

$\pm 1, 3, 9$

$$\begin{array}{r|rrrr} -1 & 1 & -9 & -9 & \\ & & -1 & 0 & 9 \\ \hline & 1 & 0 & -9 & 0 \end{array} \begin{array}{l} \\ \\ \\ R \end{array}$$

$x^2 \quad x \quad c$

$$\boxed{x = -1}$$

$$\boxed{x = \pm 3}$$

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

$$\begin{array}{r} x^2 - 9 = 0 \\ +9 \quad +9 \end{array}$$

$$\sqrt{x^2} = \sqrt{9} = x = \pm 3$$

Degree quartic
Terms polynomial of 4 terms

4. $V(x) = x^3 - 3x^2 + 3x - 1$

possible: ± 1

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

$x^2 \quad x \quad c \quad \boxed{0}r$

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

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

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

$x=1$ multiplicity of 3

Degree cubic
Terms polynomial of 4 terms

5. $S(x) = 2x^3 + 2x^2 - 6x - 12$ GCF: 2

$$2(x^3 + x^2 - 3x - 6) = 0$$

possible roots: $\pm 1, 2, 3, 6$

$$\begin{array}{r|rrrr} 2 & 1 & 1 & -3 & -6 \\ & & 2 & 6 & 6 \\ \hline & 1 & 3 & 3 & 0 \end{array}$$

$x^2 \quad 3x \quad 3c \quad \boxed{0}r$

$$x=2$$

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

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

$a \quad b \quad c$

$$x = \frac{-3 \pm \sqrt{9-4(3)}}{2} \Rightarrow \frac{-3 \pm \sqrt{9-12}}{2} \Rightarrow \frac{-3 \pm \sqrt{-3}}{2} \Rightarrow \frac{-3 \pm \sqrt{3}i}{2}$$

Degree cubic
Terms polynomial of 4 terms

6. $W(x) = x^5 - 13x^3 + 36x$ GCF: x

$$x(x^4 - 13x^2 + 36) = 0$$

$$x(x^2 - 9)(x^2 - 4) = 0$$

$$\begin{array}{l} x^2 - 9 = 0 \\ +9 \quad +9 \end{array}$$

$$\begin{array}{l} x^2 - 4 = 0 \\ +4 \quad +4 \end{array}$$

$$\sqrt{x^2} = \sqrt{9}$$

$$\sqrt{x^2} = \sqrt{4}$$

$$x = \pm 3$$

$$x = \pm 2$$

$$x=0$$

$$x = \pm 3$$

$$x = \pm 2$$

Degree quintic
Terms trinomial