



SOLVING POLYNOMIALS WORKSHEET

Rational Root Theorem

If a polynomial has a rational root,

the possible roots = $\frac{-p}{q}$

p = a factor of the constant

q = a factor of the leading coefficient

ex: $3x^3 + 8x^2 - 9x + 2 = 0$

Roots = $\frac{\text{-factors of } 2}{\text{factors of } 3}$

$\pm \frac{1,2}{1,3} = \pm \frac{1}{1}, \frac{1}{3}, \frac{2}{1}, \frac{2}{3}$

$3x^3 + 5x^2 - 16x - 12 = P(x)$
 Factors of -12: $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

$\begin{array}{r|rrrr} 3 & 3 & 5 & -16 & -12 \\ & & 2 & 8 & -8 \\ \hline & 3 & 7 & -8 & -20 \end{array}$ $\begin{array}{r|rrrr} -1 & 3 & 5 & -16 & -12 \\ & & -3 & -2 & 18 \\ \hline & 3 & 2 & -18 & 6 \end{array}$

$\begin{array}{r|rrrr} 2 & 3 & 5 & -16 & -12 \\ & & 6 & 22 & 12 \\ \hline & 2 & -1 & -38 & -24 \end{array}$

$(x-2)(3x^2+11x+6) \Rightarrow (x-2)(3x+2)(x+3)$
 Factors of $P(x)$ Roots @ $(2, -3, -\frac{2}{3})$

Using the Fundamental Theorem of Algebra, state the number of complex roots. Using the Rational Root theorem, list all the possible rational roots and then find all of the zeros.

1) $x^4 - 14x^2 + 45 = 0$

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

3) $x^4 + 6x^2 + 8 = 0$

4) $x^3 = 1$

5) $x^6 - x^4 - x^2 + 1 = 0$

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

7) $x^3 - 2x^2 - 11x + 12 = 0$

8) $2x^4 - 5x^3 - 11x^2 + 20x + 12 = 0$

9) $8x^4 - 18x^2 + 4 = 0$
Hint: Use a grapher

10) $8x^4 + 10x^2 = 3$
Hint: Use a grapher

11) An engineer is designing a storage compartment in a spacecraft. The compartment must be 2 meters longer than it is wide and its depth must be 1 meter less than its width. The volume of the compartment must be 8 cubic meters.

- a) Write an equation to model the volume of the compartment.
- b) List all possible rational roots.
- c) Use synthetic division to find the roots of the polynomial equation. Are the roots all rational numbers?
- d) What are the dimensions of the storage compartment?