

Lesson #12 C: Understanding Roots of Polynomials and Finding the Roots of Higher Order Polynomials (Reference: Lesson #62, #65, #66, #76, #85, #95 & #106 in book)**Problem**

- Determine whether each of the following are roots or factors of the given polynomial. (HINT: Synthetic Division may help you in determining this.) (SHOW ALL OF YOUR WORK!!)
 - Is $(x + 3)$ a factor of $f(x) = 3x^3 + 5x^2 - 16x - 12$.
 - Is $x = 2$ a root of $f(x) = x^6 - 4x^4 - 9x^2 + 36$.
 - Is $(2x - 1)$ a factor of $f(x) = 2x^4 + 5x^3 + 3x^2 + 15x - 9$.
 - Is $x = -3$ a root of $f(x) = x^5 + 4x^4 - 10x^2 - x + 6$.
 - Is $(3x + 2)$ a factor of $f(x) = 3x^3 + 2x^2 - 3x - 2$.
 - Is $x = 5$ a root of $f(x) = 2x^6 - 43x^5 + 75x^4 + 1765x^3 - 857x^2 - 22,542x - 30,240$.
- Determine all the roots of the following polynomial functions. Express all of the roots (REAL or IMAGINARY) in your final answer. (HINT: Fully factor each function to help find all of the roots.)
 - $f(x) = 4x^3 - 3x^2 - 25x - 6$
 - $f(x) = 3x^3 + 5x^2 - 16x - 12$
 - $f(x) = x^4 - 2x^3 - 5x^2 + 8x + 4$
 - $f(x) = 4x^4 + 4x^3 - 11x^2 - 12x - 3$
 - $f(x) = x^3 + 3x^2 + 4x + 12$
 - $f(x) = x^4 + 2x^3 + 10x^2 + 18x + 9$
 - $f(x) = 2x^4 + 5x^3 + 3x^2 + 15x - 9$
 - $f(x) = x^4 - 3x^3 - 5x^2 + 29x - 30$
 - $f(x) = x^4 - 9x^3 + 19x^2 + 31x - 102$
 - $f(x) = x^5 - 4x^4 - 7x^3 + 14x^2 - 44x + 120$