

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

1. 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!!)

1. Is  $(x - 4)$  a factor of  $f(x) = 2x^4 - 9x^3 + 2x^2 + 9x - 4$ .

2. Is  $x = -3$  a root of  $f(x) = x^4 - 9x^3 + 19x^2 + 31x - 102$ .

3. Is  $(3x - 1)$  a factor of  $f(x) = 3x^4 + 5x^3 + 25x^2 + 45x - 18$ .

4. Is  $x = -2$  a root of  $f(x) = x^6 - 4x^4 - 9x^2 + 36$ .

5. 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.)

5.  $f(x) = 2x^5 - 6x^4 - 56x^3$

6.  $f(x) = (x - 7)(x^4 - 8x) - (x - 7)(-8x + 1)$

7.  $f(x) = 2x^4 - 14x^3 - 8x^2 + 56x$

8.  $f(x) = 2x^4 - 14x^3 + 26x^2 - 30x$

9.  $f(x) = x^4 - 2x^3 - 5x^2 + 8x + 4$

10.  $f(x) = 2x^4 + 5x^3 + 3x^2 + 15x - 9$

11.  $f(x) = x^4 - 3x^3 - 5x^2 + 29x - 30$

12.  $f(x) = x^5 - 4x^4 - 7x^3 + 14x^2 - 44x + 120$