The Fundamental Theorem of Algebra

Every polynomial has at least 1 zero (x-intercept) in the complex set of numbers. The number of zeroes is equal to the largest exponent of the variable, which is called the degree. The coefficient of the variable with the greatest exponent is called the leading coefficient.

Example 1: $y = x^4 - 1$ has four complex zeroes.

To find the zeroes of a polynomial, apply a factoring method (synthetic division, difference of squares, ...) to reduce the polynomial to a product of linear pairs such as $y = (x + 1)(x - 1)(x + 3)$.

Example 2: Factor the following to determine the zeroes.

$f(x) = x^4 + x^2 - 6$

Example 3: Factor the following to determine the zeroes.

$f(x) = x^3 - 25x$

Example 4: Factor the following to determine the zeroes.

$f(x) = x^2 + 4$

Since imaginary and irrational zeroes come in conjugate pairs, use the following information to write f(x) as a product of linear pairs.

Example 5: Zeroes of f(x) include x = 3 and x = 2i. Express f(x) as a polynomial.

Example 6: Zeroes of f(x) include x = 3 and x = 2 - i. Express f(x) as a polynomial.

Homework p 210 #15-20, 32-47 (No graphing)