2.5 - Factoring and Complex Zeros

Skills

- Find a polynomial with a given set of zeros
- Identify the zeros and multiplicities of a polynomial

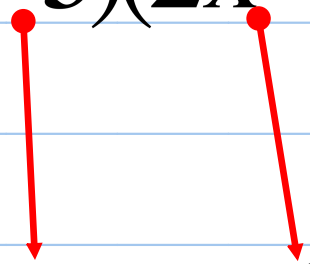
Factors and Roots

The following are equivalent:

$(x - a)$ is a **factor** of a polynomial
$x = a$ is a **root** or **zero** of the polynomial

Worked Example

Find the roots of $(x+5)(2x-3)$



$$x = -5,\ x = \frac{3}{2}$$

Multiplicity

The **multiplicity** of a factor/root indicates the exponent that the factor has.

$$(x-1)(x+3)^2$$

Worked Example

Write a polynomial with roots
1 and -2 (multiplicity 3).

$$(x-1)(x+2)^3$$

Example

Find the roots (and multiplicities) of

$$(x-3)^3(x-5)$$

Example

Write a polynomial with roots
1, -1 and 2 (mult. 3)

Irrational Roots

If your polynomial is "pretty," then these must come in **conjugate pairs**.
(*typically, with a ± in front of a radical*)
You'll find these through **factoring**, or the quadratic formula.

Example

$$(x - 2)(x^2 - 5)$$

Non-Real Roots

You'll also find these through factoring, or the quadratic formula.
These will also come in conjugate pairs.

Example

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

Example

$$x^2 - 2x + 5$$