6.7 Part 2 Writing Polynomial Functions

Complex Conjugate Root Theorem

If P is a polynomial function with real-number coefficients and a + bi (where b ≠ 0) is a root of P(x) = 0, then a - bi is also a root of P(x) = 0.

In other words...

Complex zeros always come in conjugate pairs.

Example 1

Write a polynomial function, P, in factored form and in standard form by using the given information.

P is of $\boxed{\text{degree 2}}$; zeros: x= 4, x= -2

highest exponent

$$\boxed{P(x) = (x-4)(x+2)}$$

factored form

FOIL

$$x^2+2x-4x-8$$

$$\boxed{P(x) = x^2-2x-8}$$

standard form

Example 2

Write a polynomial function, P, in factored form and in standard form by using the given information.

P is of degree 3; zeros: -1, 2, 5

factored form $P(x) = (x+1)(x-2)(x-5)$

$x^2-2x+1x-2$

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

$x^3-x^2-2x-5x^2+5x+10$

standard form $P(x) = x^3-6x^2+3x+10$

Example 3

Write a polynomial function, P, in factored form and in standard form by using the given information.

P is of degree 3; zeros: 3, i, $-i$

$i^2=-1$

factored form $P(x) = (x-3)(x-i)(x+i)$

$x^2+ix-ix-i^2$

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

x^3+x-3x^2-3

$P(x) = x^3-3x^2+x-3$ standard form

Example 4

Write a polynomial function, P, in factored form and in standard form by using the given information.

P is of degree 3; zeros: -5, $2i$, $-2i$

factored form $\boxed{P(x) = (x+5)(x-2i)(x+2i)}$

$x^2+2ix-2ix-4i^2$

$(x+5)(x^2-4(-1))$

$(x+5)(x^2+4)$

$x^3+4x+5x^2+20$

standard form $\boxed{P(x) = x^3+5x^2+4x+20}$

Example 5

Write a polynomial function, P, in factored form and in standard form by using the given information.

P is of degree 4; zeros: -2, 1, $3i$, $-3i$

factored form $\boxed{P(x) = (x+2)(x-1)(x-3i)(x+3i)}$

$x^2+3ix-3ix-9i^2$ ← -1

$(x+2)(x-1)(x^2+9)$

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

$(x^2+x-2)(x^2+9)$

$x^4+x^3-2x^2+9x^2+9x-18$

standard form $\boxed{P(x) = x^4+x^3+7x^2+9x-18}$