Day 2 on 2.5

Find a polynomial with the given zeros.

Ex 1) -1, -1, 3i, -3i

$(x+1)(x+1)(x-3i)(x+3i)$

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

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

$= x^4+2x^3+x^2+9x^2+18x+9 = x^4+2x^3+10x^2+18x+9$

Ex 2) $f(x) = x^2 + 1$ is said to be irreducible over the reals and is prime. But we can still write a linear factorization.

$(x+i)(x-i)$

x^2-2

$(x-\sqrt{2})(x+\sqrt{2})$

Ex 3) Use the given zero to find all the zeros of the polynomial.

$f(x) = x^3 + x^2 + 9x + 9$ zero: 3i, -3i

$x = -1$

	1	1	9	9
$3i$		$3i$	$3i+9i^2$	$9i-9i^2$
	1	$1+3i$	$3i$	0

	1	$1+3i$	$3i$
$-3i$		$-3i$	$-3i$
	1	1	0

$x+1=0$

$x=-1$

Ex 4) Use the given zero to find all the zeros of the polynomial.

$f(x) = x^4 - 3x^3 + 6x^2 + 2x - 60$ zero: $1 + 3i$, $1-3i, 3, -2$

$1+3i$ | $1 \quad -3 \quad 6 \quad 2 \quad | \quad -60$

$1+3i \quad -11+3i \quad 60+18i$

$1 \quad -2+3i \quad -5+3i \quad 6+18i \quad | \quad 0$

$(1+3i)(-2+3i)$

$-2+3i-6i+9i^2$

$-11-3i$

$(1+3i)(6-18i)$

$6-54i^2$

$6+54=60$

$-18i+18i$

$(1+3i)(-5-3i)$

$-5-18i-9i^2$

$4-18i$

$-3i-15i$

$1-3i$ | $1 \quad -2+3i \quad -5+3i \quad | \quad 6-18i$

$1-3i \quad -1+3i \quad -6+18i$

$1 \quad -1 \quad -6 \quad | \quad 0$

$x^2 - x - 6 = 0$

$(x-3)(x+2) = 0$

$x-3=0$ $\quad x+2=0$

$x=3$ $\quad x=-2$