2.5 Day 2 Notes

Wednesday, September 21, 2016 9:18 AM

Precalculus - Section 2.5

Complex Zeros and The Fundamental Theorem of Algebra

The Fundamental Theorem of Algebra

A polynomial function of degree N has N complex zeros.
This includes REAL and COMPLEX zeros.
Repeated zeros count each time they occur.

Complex Conjugate Zeros

If f(x) is a polynomial function with real coefficients
and f(x) has a complex zero of $a+bi$ where $b \neq 0$,
then $a-bi$ is also a zero of the polynomial.

complex zeros come in pairs

Write a polynomial function of minimum degree with the given zeros in factored form and graph the function,

1) -3, 4, 2-i

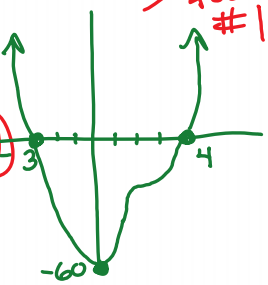
if 2-i is a zero, 2+i must also be a zero

$f(x)=(x+3)(x-4)(x-(2-i))(x-(2+i))$

Degree = 4 (2 Real zeros, 2 complex zeros)

$y\text{-int}: x=0 \quad (3)(-4)(+(2-i))(+(2+i)) = -12(4-i^2) = -12(5) = -60$

Graph for #1



2) 1, 1+2i, 1-i

1-2i, 1+i

$f(x)=(x-1)(x-(1+2i))(x-(1-2i))(x-(1+i))(x-(1-i))$

Degree = 5

Write the polynomial functions in standard form
(THAT MEANS ALL MULTIPLIED OUT!)

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

Deg = 4
1 Repeated Real zero
2 complex zeros

FOIL

$=(x^2-6x+9)(x^2-i^2)$

$=(x^2-6x+9)(x^2+1)$

$x^4-6x^3+9x^2+x^2-6x+9$

$$= (x^2 - 6x + 9)(x^2 + 1)$$

$$= x^4 - 6x^3 + 9x^2 + x^2 - 6x + 9$$

$$f(x) = x^4 - 6x^3 + 10x^2 - 6x + 9$$

2) $f(x)=(x-5)\left(x-i\sqrt{2}\right)\left(x+i\sqrt{2}\right)$

3) $f(x)=(x-1)(x+1)(x+i)(x-i)\left(x-(1+\sqrt{2}i)\right)\left(x-(1-\sqrt{2}i)\right)$

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

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

$(x^4-1)(x^2-2x+3)$

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

	x	-1	$-\sqrt{2}i$
x	x^2	$-x$	$-x\sqrt{2}i$
-1	$-x$	1	$\sqrt{2}i$
$+\sqrt{2}i$	$x\sqrt{2}i$	$-\sqrt{2}i$	$-2i^2$ $(+2)$

	x^4	-1
x^2	x^6	$-x^2$
$-2x$	$-2x^5$	$2x$
$+3$	$3x^4$	-3

Factor the following polynomial functions completely into linear factors.

$f(x)=x^3-5x^2+2x-10$

$f(x)=x^4-8x^2-9$