

Given complex # $a+bi$, its complex conjugate is $a-bi$

Honors Advanced Algebra

Name: _____

Target 2D: Writing Polynomial Functions Given Zeroes

Date: _____

Write a polynomial function of least degree with real coefficients whose zeroes include the following:

1. $-5, 2i$ (degree 3) complex conjugate

Zeros: $x = -5, x = 2i, x = -2i$

Factors: $(x+5), (x-2i), (x+2i)$
multiply 1st

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

(left over factors: $(x+5), (x^2+4)$)
multiply last

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

$\therefore f(x) = x^3 + 5x^2 + 4x + 20$
 degree 3 ✓

2. $4, 1-i$ (degree 3) complex conjugate

Zeros: $x = 4, x = 1-i, x = 1+i$

Factors: $(x-4), (x-1+i), (x-1-i)$
multiply 1st

x	x^2	$-x$	i
-1	$-x$	$+1$	$-i$
$-i$	$-ix$	$+ix$	$-i^2 = 1$

(left over factors: $(x-4), (x^2-2x+2)$)
multiply last

x	x^3	$-2x^2$	$+2x$
-4	$-4x^2$	$8x$	-8

$\therefore g(x) = x^3 - 6x^2 + 10x - 8$
 degree 3 ✓

3. $4i, 4, -3$ (degree 4) complex conjugate

Zeros: $x = 4i, x = -4i, x = 4, x = -3$

Factors: $(x-4i), (x+4i), (x-4), (x+3)$
multiply 1st multiply 2nd

x	x^2	$-4ix$
$+4i$	$+4ix$	$-16i^2 = 16$

(x^2+16)

x	x^2	$3x$
-4	$-4x$	-12

(x^2-x-12)

Left over factors: $(x^2+16), (x^2-x-12)$
multiply 3rd (last)

x^2	x^4	$-x^3$	$-12x^2$
$+16$	$16x^2$	$-16x$	-192

$\therefore h(x) = x^4 - x^3 + 4x^2 - 16x - 192$
 degree 4 ✓

4. $\frac{1}{2}, -3i$ (degree 3) complex conjugate

Zeros: $x = \frac{1}{2}, x = -3i, x = 3i$

Factors: $(x-\frac{1}{2}), (x+3i), (x-3i)$
multiply 1st

x	x^2	$3ix$
$-3i$	$-3ix$	$-9i^2 = 9$

(x^2+9)

Left over factors are: $(2x-1), (x^2+9)$
multiply last

$2x$	$2x^3$	$18x$
-1	$-x^2$	-9

$\therefore p(x) = 2x^3 - x^2 + 18x - 9$
 degree 3 ✓