PAP Algebra 2 Name: Key

Sec. 5.5 Notes – Writing Polynomial Equations

Sometimes, we need to write quadratic equations given imaginary/complex roots.

1. For example, given $\pm 4i$ as your roots, create a polynomial in <u>standard form</u>.

a) First, write out the factors that you would use to obtain the complex solution.

$(x+4i)(x-4i)$

b) Next, multiply the factors.

	x	$+4i$
x	x^2	$4xi$
$-4i$	$-4xi$	$-16i^2$

x^2-16i^2 $\quad i^2=-1$

x^2+16

c) Write your polynomial function in <u>standard form</u>.

x^2+16

2. Let's try one more: Write the quadratic with roots at $\pm 3i$ and $\frac{5}{2}$

$(x+3i)(x-3i)(2x-5)$

$x=\frac{5}{2}$

$x-\frac{5}{2}=0$

$2x-5=0$

	x	$+3i$
x	x^2	$3xi$
$-3i$	$-3xi$	$-9i^2$

x^2-9i^2

x^2+9

	$2x$	$+9$
$2x$	$2x^3$	$18x$
-5	$-5x^2$	-45

$2x^3-5x^2+18x-45$

3. Now, for the final type. What if your roots are $1 \pm 5i$?

a) Write out the factors that you would use to obtain the complex solution. Remember to change signs of everything in your root when you put it into a factor.

$(x-1-5i)(x-1+5i)=0$

$x=1+5i$

$x=1-5i$

b) Using the box method, multiply the factors. Notice since you have 3 terms in each factor, the box is now a 3 x 3 box.

	x	-1	$-5i$
x	x^2	$-x$	$-5xi$
-1	$-x$	1	$5i$
$+5i$	$5xi$	$-5i$	$-25i^2$ → 25

$x^2-2x+1-25i^2$

$x^2-2x+1+25$

$x^2-2x+26$

c) Write your polynomial function in <u>standard form</u> from your boxes. Note, you cannot leave i^2

$x^2-2x+26$

4. Now, let's practice with $2 \pm 3i$

a) What are the factors?

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

b) Multiply out the factors using a box:

	x	-2	$-3i$
x	x^2	$-2x$	$-3xi$
-2	$-2x$	4	$6i$
$+3i$	$3xi$	$-6i$	$-9i^2$ → 9

$x^2-4x+4-9i^2$

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

c) What is the equation of your quadratic in standard form?

$\boxed{x^2-4x+13}$

PAP Algebra 2
Sec. 5.5 Skills Practice

Name: Key

Write the equation in standard form of a polynomial with the following solutions/roots/zeros.

1. x = -3 and x = 15

$(x+3)(x-15)=0$

$x^2+3x-15x-45=0$

$x^2-12x-45$

2. x = 2 and x = $\frac{4}{3}$

$(x-2)(3x-4)=0$

$3x^2-4x-6x+8$

$3x^2-10x+8$

3. x = $\frac{1}{2}$, x = $\frac{-2}{3}$, and x = -2

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

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

$6x^2+x-2$

	$6x^3$	$+x^2$	$-2x$
x			
$+2$	$12x^2$	$2x$	-4

$6x^3+13x^2-4$

4. x = $\pm 3i$ and x = -5

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

$(x^2+9)(x+5)$

$x^3+5x^2+9x+45$

$x^3+5x^2+9x+45$

5. $x = 1 \pm 5i$

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

	x	-1	$-5i$
x	x^2	$-x$	$-5xi$
-1	$-x$	1	$5i$
$5i$	$5xi$	$-5i$	$-25i^2$

$x^2 - 2x + 1 + 25$

$x^2 - 2x + 26$

6. $x = 2 \pm 3i$ and $x = 1$

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

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

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

$(x^2 - 4x + 13)(x-1)$

	x^2	$-4x$	13
x	x^3	$-4x^2$	$13x$
-1	$-x^2$	$+4x$	-13

$x^3 - 5x^2 + 17x - 13$

7. $x = \frac{1}{3}$ $x = -\frac{2}{5}$ $x = 4$

$(3x-1)(5x+2)(x-4)$

$15x^2 + 6x - 5x - 2$

$15x^2 + x - 2$

	$15x^3$	x^2	$-2x$
x			
-4	$-60x^2$	$-4x$	8

$15x^3 - 59x^2 - 6x + 8$