CCSS Advanced Algebra 4 Operations with Complex Numbers Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Use an area model to show that the function $g(x)=(x-2-i)(x-2+i)$ is equivalent to $g(x)=x^{2}-4x+5$ in Standard Form.

2. *Addition and Subtraction of Complex Numbers (think like terms…)*

 Simplify each sum or difference to the form $a+bi$.

* 1. $(3+i)+(2i-1)$ b. $(3i-4)-(5-2i)$ c. $(i^{2}+2i+1)-(3i-5)$

3. *Complex Equations*. Check your answers.

a. Solve $w+(6+i)=3$ for $w$ b. Solve $3w-2i=w+4i-6$ for $w$

4. Two Complex Numbers are called **Conjugates** if they are in the form $a+bi$ and $a-bi$.

a. Which of the following pairs of complex numbers are conjugates? Select all that apply.

$3+2i and -3+2i$ $3+2i and -3-2i$ $i and -i$ $3+2i and 3-2i$

 b. What happens when you add conjugates? In other words, what is $(a+bi)+(a-bi)?$

 c. What happens when you subtract conjugates? In other words, what is $(a+bi)-(a-bi)$?

4. *Multiplication of Complex Numbers*:

Use an Area Model to complete each product. Write the answer in the form $a+bi$.

a. $(3+i)(2i-1)$ b. $(3i-4)(5-2i)$ c. $i(2i-5)$

d. $(-i+5)(-i-5)$ e. $(4+2i)(4-2i)$

5. Given your answer to parts (d) and (e), what is the product of Conjugate Complex Numbers? In other words, what is $(a+bi)(a-bi) $for any values of $a$ and $b$?

6. a. Find the roots of $f(x)=4x^{2}+9$and show they are Conjugate Complex Numbers.

b. Find the roots of $g(x)=x^{2}+2x+3$and show they are Conjugate Complex Numbers.

 c. Use the Quadratic Formula to explain why the complex roots of $y=ax^{2}+bx+c$ must be conjugates.

7. A polynomial has roots $x=1, x=2, x=4-i and x=4+i$. Write the polynomial in Standard Form.

8. Challenge: Solve $w(1-i)=5-i$ Solve for $w$.

9. Practice Rational Expressions:

Simplify each of the following:

a. $\frac{2x^{2}}{x+1}-\frac{2}{x+1}$ b. $\frac{3}{x-2}+\frac{1}{x+3}$ c. $\frac{4}{(x-2)(x+2)}-\frac{1}{x-2}$

d. $\frac{5}{x}+\frac{x}{x^{2}+x}$ e. $\frac{(x-3)(x+4)}{(x-1)^{2}}⋅\frac{(x-1)}{(x-3)(x-4)^{2}}$ f. $\frac{x^{2}+2x+1}{x^{2}-25}⋅\frac{x^{2}-6x+5}{x^{2}-1}$