Name: _____ Date: _____

INTRODUCTION TO COMPLEX NUMBERS
ALGEBRA 2 WITH TRIGONOMETRY

All numbers fall into a very broad category known as complex numbers. Complex numbers can always be thought of as a combination of a real number with an imaginary number and will have the form:

$a+bi$ where a and b are real numbers

We say that a is the real part of the number and bi is the imaginary part of the number.

Graphing Complex Numbers – Complex numbers can be graphed, just like real numbers. Unlike real numbers, since complex numbers have two components, real and imaginary, they must be plotted in a two-dimensional system. This two dimensional system is called the **complex plane** or the **Argand plane**.

***Exercise* #1:** Plot each of the following complex numbers on the complex plane shown below. Label them by letter.

(a) $5-2i$

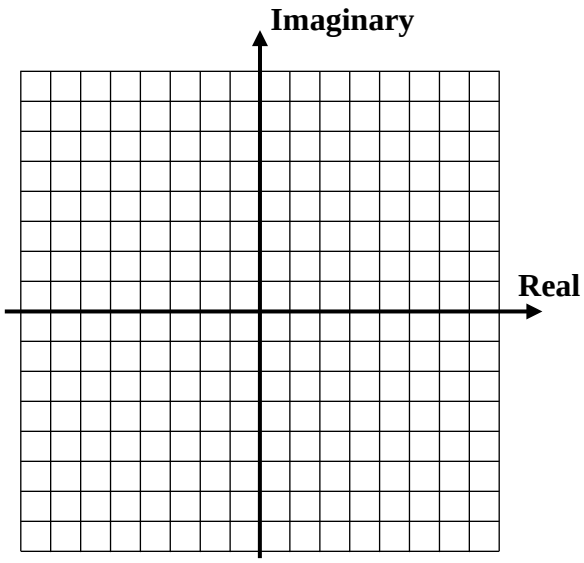
(b) $3+7i$

(c) $-2+6i$

(d) $-4-i$

(e) $5i$

(f) -6



***Exercise* #2:** If the complex number $-3+5i$ were plotted in the complex plane, it would land in which of the following quadrants?

(1) I (3) III

(2) II (4) IV _____

Finding the Size or Modulus of a Complex Number – Although it is not possible to say whether one complex number is greater than another, it is possible to compare their sizes. The size, or modulus, of a complex number is calculated as

$$|a+bi| = \sqrt{a^2+b^2}$$

***Exercise* #3:** Find the size of each of the following complex numbers. Simplify your answers.

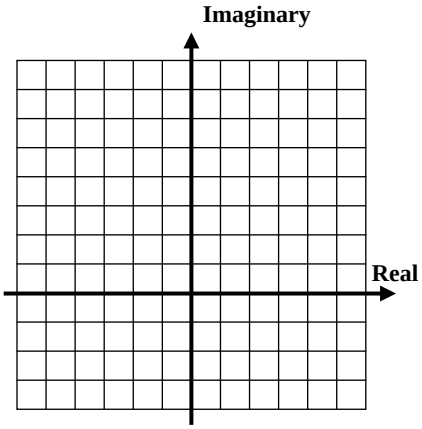
(a) $3-4i$ (b) $12+5i$ (c) $-4+2i$

Notice that the modulus of a complex number is a real number.

***Exercise* #4:** Consider the complex number $-3+6i$.

(a) Plot this number on the plane below.

(b) Find the modulus of this number in simplest form.



(c) What distance does the modulus represent on the graph? Explain by illustrating your answer on the graph.

Like real numbers, complex numbers may be added and subtracted. The key to these operations is that real components can combine with real components and imaginary with imaginary.

***Exercise* #5:** Find each of the following sums and differences.

(a) $(-2+7i)+(6+2i)$ (b) $(8+4i)+(12-i)$ (c) $(5+3i)-(2-7i)$ (d) $(-3+5i)-(-8+2i)$

***Exercise* #6:** If the sum of $(6+2i)$ and $(-8-5i)$ were plotted in the complex plane, in which quadrant would it fall?

(1) I (3) III

(2) II (4) IV

_____

***Exercise* #7:** When plotted, which of the following complex numbers would fall furthest from the origin?

(1) $3+4i$ (3) $-2+8i$

(2) $4-7i$ (4) $1+6i$

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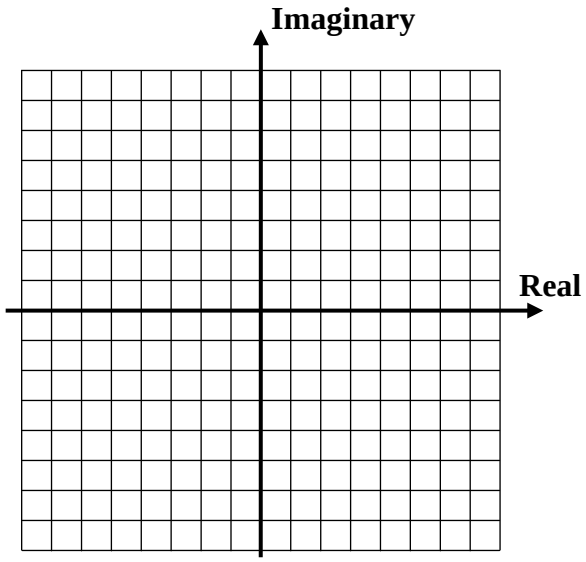
INTRODUCTION TO COMPLEX NUMBERS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Plot each of the following complex numbers on the plane below. Label each with its letter.



(a) $2+5i$

(b) $-3-4i$

(c) $7-2i$

(d) 4

(e) $-6i$

(f) $-5+5i$

(g) $2-8i$

2. Find the modulus of each of the following complex numbers in simplest form.

(a) $-5+12i$ (b) $2-4i$ (c) $-6-8i$

(d) $10+5i$ (e) $-3+9i$ (f) $-4-8i$

3. When plotted in the complex plane, which of the following numbers is furthest from the origin?

(1) $7+4i$ (3) $-5-11i$

(2) $8-2i$ (4) $-9+8i$

_____

4. Of the fours choices below, which is closest to the origin when plotted in the complex plane?

   (1) $-6+10i$ (3) $7-2i$

   (2) $-3-3i$ (4) $5+i$ _____

5. Find each of the following sum or difference.

   (a) $(6+3i)+(-2+9i)$ (b) $(-7+i)-(3+5i)$ (c) $(10-3i)+(6-8i)$

   (d) $(-2+7i)-(15-6i)$ (e) $(15+2i)+(5-5i)$ (f) $(-1+i)-(-5-6i)$

6. When the numbers $(4-2i)$ and $2-5i$ are added and the result is plotted, it will fall in which quadrant?

   (1) I (3) III

   (2) II (4) IV _____

7. If $(3-5i)$ is subtracted from $(1-3i)$ the result would be plotted in which of the following quadrants of the complex plane?

   (1) I (3) III

   (2) II (4) IV _____

REASONING

8. Consider the two complex numbers $(3+4i)$ and $(5+3i)$.

   (a) Plot both numbers on the complex plane given.

   (b) Find the sum of these numbers and plot it as well.

   (c) Along with the origin, connect these four points to form a quadrilateral.

   (d) What special type of quadrilateral is this?