Math-2

Inclass 9-1

Adding, Subtracting, Multiplying, and Dividing Imaginary Numbers

Instructions. Work in pairs. Both students need a copy of this handout. One person in the team should read item #1 below while the other person follows along. Both students should do what the item number tells you to do. If there are no actions required for the item number, have the other person read the next item number. Alternate between one person reading and the other person following along until you are finished. BOTH students should individually complete each task as directed by an item number then compare answers with their team mate.

1. Remember (from way back) that the imaginary number "i" is: $i = \sqrt{-1}$ and $i^2 = -1$

2. When adding and subtracting complex numbers (real number and an imaginary number in the form of a + b*i*, you need to combine "like terms." Real number integers are always "like terms" to each other. Imaginary numbers are "like terms" to each other.

3. Add the following complex numbers. Write your answers to the right of each problem.

a. $(2-3i)+(-3-5i)$

b. $3(4-2i)-2(-5-6i)$

4. To multiply complex numbers, "i-based powers" are simplified by substituting (-1) everywhere you see an (i^2). It is often easier to multiply binomials using the "box method."

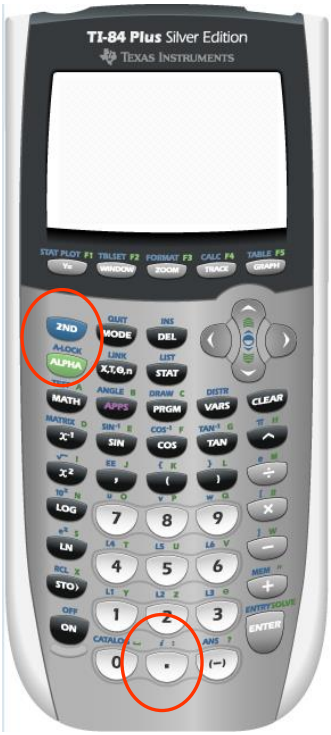
5. Multiply the following complex numbers. Write your answers to the right of each problem.

a. $2i*(3-4i)$

b. $(4-2i)(5+6i)$

6. Dividing monomial complex numbers is like dividing radicals. You multiply by "one, in the form of…." For example:

$$\frac{3}{\sqrt{2}}*\frac{\sqrt{2}}{\sqrt{2}}=\frac{3\sqrt{2}}{2}, \qquad \frac{3}{2i}\rightarrow\frac{3}{2i}*\frac{i}{i}\rightarrow\frac{3i}{2i^2}\rightarrow\frac{3i}{-2}$$



7. Divide the following complex numbers. Write your answers to the right of each problem.

a. $\frac{5}{2i}$ b. $\frac{3i}{5i^2}$

8. Dividing binomial radical numbers is harder. You must multiply by "one, in the form of the conjugate of the denominator over the ….."

$$\frac{3}{5+\sqrt{2}}*\frac{5-\sqrt{2}}{5-\sqrt{2}}=\frac{15-3\sqrt{2}}{25-4}=\frac{15-3\sqrt{2}}{21}=\frac{3}{3}*\frac{5-\sqrt{2}}{7}=\frac{5-\sqrt{2}}{7}$$

9. BUT, before I make you do that with complex numbers, I'm going to show you how to add, subtract, multiply, and divide complex number using the "power of the calculator".

Notice what happens when you push the following buttons on your calculator:

2nd	+	(decimal symbol)	→ "i"

10. Type into your calculator the following expression exactly as you see it here: $(2-3i)+(-3-5i)$

Now push "enter." Did you get the same answer as you did in part 3a. above?

11. To avoid PEMDAS errors (order of operations) when dividing complex numbers using the calculator, write the numerator inside of parentheses and also the denominator inside parentheses. For example $\frac{5}{2i}$ would be typed in as:

(5)÷(2*i). Now push "enter". Did you get the same answer as you did in 7a?

12. Use the calculator method to check your answers for 3b, 4a, 4b, 5a, and 5b above. Write the correct answers here.

3a: 3b: 5a: 5b: 7a: 7b:

13. The paper math method requires you do divide binomial complex fractions by multiplying by "one in the form of the conjugate of the denominator over the conjugate of the denominator." The example below shows to do this without the calculator. I used box method to multiply then I combined like terms.

$$\frac{2+3i}{4-5i} \rightarrow \frac{2+3i}{4-5i} * \frac{4+5i}{4+5i} \rightarrow \frac{8-15+12i+10i}{16-20i+20i+25} \rightarrow \frac{-7+22i}{41}$$

14. Now we will divide binomial complex numbers using the calculator. If we enter the fraction (numerator binomial divided by the denominator binomial) so that the numerator is in its own set of parentheses and the denominator is in its own set of parentheses, we just have push "enter" to complete the simplification.

Using just the calculator: $\frac{(2+3i)}{(4-5i)} \rightarrow -0.171+0.537i$ Now convert to a fraction → "math" + "fraction" + "enter". You should get: $-\frac{7}{41}+\frac{22}{41}i$. This is exactly the same as the answer above (BUT A LOT LESS WORK!!).

15. Divide the following using the calculator method:

a. $\frac{-4+2i}{3-7i}$ b. $\frac{-5-6i}{1-2i}$