Multiplying and Dividing Complex Numbers Notes

Multiplying Complex Numbers

- Distribute
- Treat the i's like variables, then simplify completely

1. $-i(3+i)$

$-3i-i^2$

$-3i-(-1)$

$\boxed{-3i+1}$

2. $(2+3i)(-6-2i)$

$-12-4i-18i-6i^2$

$-12-22i+6$

$\boxed{-6-22i}$

3. $(-3+i)(8+5i)$

4. $7(2i)(2+3i)$

$14i(2+3i)$

$28i+42i^2$

$\boxed{28i-42}$

5. $(-7-5i)(6+8i)(5+5i)$

$(-42-56i-30i-40i^2)(5+5i)$

$(-42-86i+40)(5+5i)$

$(-2-86i)(5+5i)$

$-10-10i-430i-430i^2$

$-10-440i+430$

$\boxed{420-440i}$

Dividing Complex Numbers

- Multiply numerator and denominator by i
- Simplify completely (remember your "I won, I won, negatives in the middle"

6. $\dfrac{-6-4i}{7i}\cdot\dfrac{i}{i}$

$\dfrac{-6i-4i^2}{7i^2}=\boxed{\dfrac{-6i+4}{-7}}$

7. $\dfrac{5}{-5i}\cdot\dfrac{i}{i}$

$\dfrac{5i}{-5i^2}=\dfrac{5i}{5}=\boxed{i}$

8. $\dfrac{6-6i}{-4i}\cdot\dfrac{i}{i}$

$\dfrac{6i-6i^2}{-4i^2}=\dfrac{6i+6}{4}=\boxed{\dfrac{3i+3}{2}}$

Conjugate

- Two complex numbers of the form (a +bi) and (a – bi) are complex conjugates.
- The product is always a real number.

What is the conjugate of each?

1. (2 – 4i) $2+4i$
2. (5 + 3i) $5-3i$
3. (– i +5) $-i-5$
4. (2i – 7) $2i+7$

Dividing Complex Numbers with an expression in the Denominator

- Multiply the numerator and the denominator by the conjugate of the denominator
- Simplify completely (Remember your "I won, I won negatives in the middle"
- No powers of i in the denominator of your answer!

1. $\frac{3+4i}{2-4i} \cdot \frac{(2+4i)}{(2+4i)} = \frac{6+12i+8i+16i^2}{4+8i-8i-16i^2} = \frac{6+20i-16}{4+16} = \frac{-10+20i}{20}$

First & Last

$= \boxed{\frac{-1+2i}{2}}$

2. $\frac{5-2i}{3+4i} \cdot \frac{(3-4i)}{(3-4i)} = \frac{15-20i-6i+8i^2}{9-16i^2} = \frac{15-26i-8}{9+16}$

$= \boxed{\frac{7-26i}{25}}$

3. $\frac{6-2i}{5+i}$