Warmup:

F. O. I. L.

Conjugate

Difference of Squares

$(x+3)(x-3)$

Multiply the following complex numbers:

$(3 + 2i)(4 - 5i) =$ $\quad -10(-1)$

$12 \quad \underbrace{-15i + 8i} \quad \underbrace{-10i^2}$

$12 \quad -7i \quad +10$

$\boxed{22 - 7i}$

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

$25 \quad \underbrace{\cancel{+15i - 15i}} \quad -9i^2$

$25 \quad +9$

34

$(-6 - 3i)(2 + 4i) =$

$-12 \quad -24i \quad -6i \quad -12i^2 \qquad 0 - 30i$

$\cancel{-12} \quad -30i \quad \cancel{+12} \quad = \boxed{-30i}$

$(-2 + 4i)(-2 - 4i) =$

$4 \cancel{+8i} \cancel{-8i} -16i^2$

$4 + 16 = 20$

Review Quiz #2!!

Complex Numbers and their conjugates

The conjugate of a + bi is a - bi.

The conjugate of a - bi is a + bi.

Find the conjugate of each number:

$3 + 4i \longrightarrow 3 - 4i$

$\boxed{-4} - \boxed{7i} \longrightarrow -4 + 7i$

$5i \longrightarrow -5i$

$0 + 5i$

$0 - 5i$

The product (A + B) (A - B) = $A^2 + B^2$

applies to complex numbers as well.

F O I L

x^2 $\cancel{-3x}$ $\cancel{+3x}$ -9

Recall:

(x + 3)(x - 3) = $x^2 + (-3)^2 = x^2 + 9$

(2x - 4)(2x + 4) = $(2x)^2 + (4)^2 = 4x^2 + 16$

Now, let's do that with complex numbers:

$A^2 + B^2$

$(2-3i)(2-3i)$

$4 \underbrace{-6i-6i}+9i^2$

$4 -12i -9$

$-5+12i$

$(2 + 3i)(2 - 3i) = 2^2 + (3)^2 = 4+9 = 13$

$4 \cancel{-6i+6i} - 9i^2$

$4+9 = 13$

$(-6 - 4i)(-6 + 4i) = (-6)^2 + (4)^2$

$36 + 16 = \boxed{52}$

You try:

$(7 - 2i)(7 + 2i) =$ $7^2 + 2^2 = 49 + 4 = 53$

$(-3 + i)(-3 - i) =$ $(-3)^2 + (1)^2 = 9 + 1 = 10$

$(10 - 4i)(10 + 4i) =$ $10^2 + 4^2 = 100 + 16 = 116$

Division of Complex Numbers:

To divide complex numbers, we multiply the numerator and denominator of the fraction by the conjugate of the denominator

$$\frac{(4+2i)}{(3-5i)} \cdot \frac{(3+5i)}{(3+5i)} = \frac{\overset{12 \quad +26i \quad -10}{12+20i+6i+10i^2}}{\underset{3^2 + 5^2}{9+25}} = \frac{2+26i}{34}$$

$$= \frac{2}{34} + \frac{26i}{34}$$

$$= \frac{1}{17} + \frac{13i}{17}$$

$$\frac{1+13i}{17}$$

Example:

$$\left(\frac{2+3i}{3+4i}\right) \cdot \frac{(3-4i)}{3-4i} = \frac{6 \underbrace{-8i+9i} \underbrace{-12i^2}}{3^2+4^2}$$

$$= \frac{6+i+12}{9+16} = \frac{18+i}{25}$$

Example:

$$\frac{(-5+9i)}{1-1i} \cdot \frac{(1+i)}{1+i} = \frac{-5-5i+9i+9i^2}{1^2+1^2}$$

$$= \frac{-5+4i-9}{2} = \frac{-14+4i}{2}$$

$$= -7+2i$$

Example:

$$\frac{(2-3i)}{3+5i} \cdot \frac{(3-5i)}{3-5i} = \frac{6-10i-9i+15i^2}{3^2+5^2}$$

$$= \frac{6-19i-15}{9+25} = \frac{-9-19i}{34}$$

You try:

$$\frac{6+2i}{1-3i}$$

You try:

$$\frac{2+3i}{-1+4i}$$

HW #5

Conjugates and Dividing