4.6 Dividing Complex Numbers

Conjugate of a Complex Number: The **complex conjugate** of a complex number $a+bi$ is $a-bi$.

$(a+bi)(a-bi) = a^2 + b^2$.

Examples: Find the conjugate of each number.

a) $-2+4i$

$-2-4i$

b) $1-i$

$1+i$

rewrite in complex form

c) $-3i$

$0-3i$

$3i$

opposite

d) 5

$5+0i$

$5-0i$

5

same

Dividing Complex Numbers: Multiply both the numerator and the denominator by the complex conjugate of the denominator.

$i^2 = -1$

FOIL

Examples: Divide and simplify to the form $a+bi$.

a) $\frac{7}{3i} \cdot \frac{i}{i} = \frac{7i}{3i^2}$

$\frac{7i}{3(-1)}$

$\frac{7i}{-3}$

$-\frac{7i}{3}$

$-\frac{7}{3}i$

same answers

b) $\frac{(2+6i)}{-5i} \cdot \frac{i}{i}$

$\frac{2i+6i^{(-1)}}{-5i^2}$

$-5(-1)$

$\frac{2i-6}{5}$ change order

$\frac{-6+2i}{5}$ same answers

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

c) $\frac{9i}{(-7+6i)} \cdot \frac{(-7-6i)}{(-7-6i)}$ FOIL

$\frac{-63i-54i^{(-1)}}{49+42i-42i-36i^{2}_{(-1)}}$

$49+36$

$\frac{54-63i}{85}$

OR

$\frac{54}{85} - \frac{63}{85}i$

d) $\frac{(2+3i)}{(4-5i)} \cdot \frac{(4+5i)}{(4+5i)}$ FOIL