

10/25

Thursday, October 25, 2012
8:13 AMMultiplicative Inverse (Reciprocal)

Recall: conjugates $(a+bi)(a-bi)$
 *only F, L ... $a^2 + b^2$

ex: $(5-3i)(5+3i)$

$$25 - 9\cancel{i^2}$$

$$\frac{25}{a^2} + \frac{9}{b^2} \Rightarrow 34$$

$$(2-i)(2+i) \quad a=2 \quad b=1$$

$$a^2 + b^2$$

$$4 + 1$$

$$5$$

For any non-zero complex # $a+bi$, its multiplicative inverse is ...

$$\frac{1}{a+bi}$$

*multiplicative inverse (product) = 1

$$\cancel{a+bi} \left(\frac{1}{\cancel{a+bi}} \right) = 1$$

exs:

Find the multiplicative inverse of ...

$$\textcircled{1} \quad 3+4i \Rightarrow \frac{1}{3+4i} \left(\frac{3-4i}{3-4i} \right) \Rightarrow \frac{3-4i}{9+16} = \frac{3-4i}{25}$$

*rationalize
 \Rightarrow mult. by conjugate $a^2 + b^2$

or $\frac{3}{25} - \frac{4}{25}i$

CK:

$$(3+4i) \left(\frac{3}{25} - \frac{4}{25}i \right) \text{ FOIL}$$

$$\frac{9}{25} \left[\cancel{\frac{-12i}{25} + \frac{12i}{25}} - \frac{16\cancel{i^2}}{25} \right]$$

$$\frac{9}{25} + \frac{16}{25} \Rightarrow \frac{25}{25} = 1 \quad \checkmark$$

$$\frac{9}{25} + \frac{16}{25} \Rightarrow \frac{25}{25} = 1 \checkmark$$

$$\textcircled{2} \quad 3-3i \Rightarrow \frac{1}{3-3i} \left(\frac{3+3i}{3+3i} \right) = \frac{3+3i}{9+9i^2} = \frac{3+3i}{18}$$

$$= \frac{3}{18} + \frac{3i}{18}$$

$$= \frac{1}{6} + \frac{1}{6}i$$

mult. inverse (ANS)

OK: $(3-3i)\left(\frac{1}{6} + \frac{1}{6}i\right)$ FOIL

$$\frac{3}{6} \left[\frac{+3i}{6} - \frac{3i}{6} \right] - \frac{3}{6} \boxed{i^2}$$

$$\frac{3}{6} + \frac{3}{6} = \frac{6}{6} = 1 \checkmark$$

Dividing Complex #'s

EXS:

$$\textcircled{1} \quad (2+3i) \div (1+2i)$$

Rewrite

$$\frac{(2+3i) \left(\frac{1-2i}{1-2i} \right)}{1+2i \left(\frac{1-2i}{1-2i} \right)} = \frac{2-4i+3i-\boxed{i^2}}{1+4i^2} = \frac{2-i+6}{1-4}$$

$$= \frac{8-i}{-3}$$

$$\text{OR } \frac{8}{-3} - \frac{1}{-3}i$$