Complex Conjugates

If there is a complex number a + bi, then the **complex conjugate** of that number is a - bi.

Examples of conjugates:

$3+2i \longrightarrow 3-2i$

$\frac{1}{5}+4i \longrightarrow \frac{1}{5}-4i$

$9-3i \longrightarrow 9+3i$

Recall $i = \sqrt{-1}$

Also, radicals <u>cannot</u> be in the denominator of a fraction.

Ex. $\frac{3}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$ } Rationalizing the denominator

$\rightarrow \frac{3\sqrt{2}}{2}$

Ex. $\frac{5-3i}{1-2i} \cdot \frac{(1+2i)}{(1+2i)}$ Rationalize the denominator by using the complex conjugate

$$\frac{(5-3i)(1+2i)}{(1-2i)(1+2i)}$$ - FOIL - FOIL

$$\frac{5+10i-3i-6i^2}{1\cancel{+2i-2i}-4i^2}$$

$i^2=-1$

$$\frac{5+7i-6(-1)}{1-4(-1)}$$

$$\frac{5+7i+6}{1+4}$$

$$\frac{11+7i}{5}$$

$$\boxed{\frac{11}{5}+\frac{7}{5}i}$$ ← a+bi form

$$(12+3i)\div(1+2i)$$

$$\frac{12+3i}{1+2i}\cdot\frac{1-2i}{1-2i}$$

$$\frac{(12+3i)(1-2i)}{(1+2i)(1-2i)}$$

$$\frac{12-24i+3i-6i^2}{1\cancel{-2i+2i}-4i^2}$$

$$\frac{12-21i-6(-1)}{1-4(-1)}$$

$$\frac{12-21i+6}{1+4}$$

$$\frac{18-21i}{5}$$

$$\frac{18}{5}-\frac{21}{5}i$$