

The imaginary number i is a radical (it equals $\sqrt{-1}$), so it can't stay in the denominators of fractions. What should we do if we see i in the denominator of a fraction?

If there is **exactly one** term – multiply with $\frac{i}{i}$

Example 1 Simplify $\frac{-5+2i}{6i}$

There is exactly one term ($6i$) in the denominator, so we will multiply by $\frac{i}{i}$.

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

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

If there are **two** terms – use the conjugate

If the original is...

$$5 + 3i$$

$$2 - 8i$$

$$\sqrt{10} + 4i$$

then the conjugate is...

$$5 - 3i$$

$$2 + 8i$$

$$\sqrt{10} - 4i$$

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

The denominator is $6 - 5i$, so the conjugate is $6 + 5i$.

$$\frac{3 + 2i}{6 - 5i} \cdot \frac{6 + 5i}{6 + 5i} = \frac{18 + 15i + 12i + 10i^2}{36 + 30i - 30i - 25i^2} = \frac{18 + 27i + 10(-1)}{36 - 25(-1)} =$$

The terms with i in them will “drop out” because they add to zero... that’s why we use the conjugate!

$$\frac{18 + 27i - 10}{36 + 25} = \frac{8 + 27i}{61}$$

$$\frac{8}{61} + \frac{27}{61}i$$