

Simplify the following expression:

$$(2 + 3i) \left[(2 - 3i) + \frac{1}{2 - 3i} \right]$$

Solution It is easiest to solve this problem in two pieces (rather than putting the two terms over a common denominator).

$$\begin{aligned}(2 + 3i)(2 - 3i) &= 4 - 6i + 6i - 9(i)^2 \\ &= 13\end{aligned}$$

$$\begin{aligned}\frac{2 + 3i}{2 - 3i} &= \left(\frac{2 + 3i}{2 - 3i} \right) \left(\frac{2 + 3i}{2 + 3i} \right) \\ &= \left(\frac{4 + 6i + 6i - 9}{13} \right) \\ &= \left(\frac{-5 + 12i}{13} \right)\end{aligned}$$

Don't stop simplifying until you have the complex number in rectangular form, i.e.

$$(\text{real number}) + i(\text{real number})$$