Review the Substitution Method (RSM)

Familiarity can make us overconfident about our abilities: “I am such a good driver I can text, too!”

It is like this with the substitution rule for integration: we come to feel we can do integrals such as

\[ \int e^{ax+b} \, dx \quad \text{and} \quad \int \cos(ax + b) \, dx \]

without it. A case in point: A student may follow up

\[ \int e^{2x} \, dx \quad \text{with} \quad 2e^{2x} + C. \]

A more methodical approach would be to carry out the substitution \( u = 2x \), which means \( 2 \, du = dx \) or \( dx = \frac{1}{2} \, du \), so that

\[ \int e^{2x} \, dx \quad \text{becomes} \quad \frac{1}{2} \int e^{u} \, du = \frac{1}{2} e^{u} + C = \frac{1}{2} e^{2x} + C, \]

which is the correct answer. Your professor has nothing against skipping this substitution step and jumping to the answer, so long as it can be done correctly. Sadly, I would estimate perhaps one out of every three times students think they can get the correct answer while skipping the substitution step, they fail to do so!