Find $\int \sin 2x \cos 2x \, dx$. Check your answer.

**Answer:** Let $u = \sin 2x$. So, $du = 2 \cos 2x \, dx$, and $\frac{1}{2}du = \cos 2x \, dx$. The original integral is equal to

$$\frac{1}{2} \int u \, du = \frac{1}{4}u^2 + C = \frac{1}{4} \sin^2 2x + C.$$

**Check:** The derivative of the proposed answer is

$$\frac{1}{4}(2) \sin 2x(\cos 2x) = \sin 2x \cos 2x. \checkmark$$