

11. $\int \sin^2 x \cos^2 x \, dx$ (10 points)

$$\int \sin^2 x \cos^2 x \, dx$$

$$= \int (\sin x \cos x)^2 \, dx$$

Use $\sin x \cos x = \frac{\sin 2x}{2}$

$$\int (\sin x \cos x)^2 \, dx$$

$$= \int \frac{\sin^2(2x)}{4} \, dx$$

$$= \frac{1}{4} \int \sin^2(2x) \, dx$$

Use $\sin^2(x) = \frac{1 - \cos 2x}{2}$

so $\sin^2(2x) = \frac{1 - \cos 4x}{2}$

so $\frac{1}{4} \int \sin^2(2x) \, dx$

$$= \frac{1}{4} \int \frac{1 - \cos 4x}{2} \, dx$$

$$= \frac{1}{8} \int (1 - \cos 4x) \, dx$$

$$= \boxed{\frac{1}{8} \left(x - \frac{\sin 4x}{4} \right) + C}$$