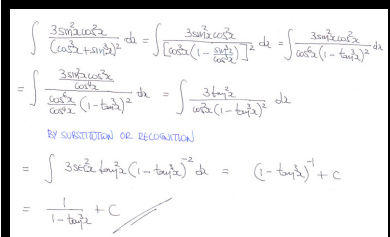


Question

By expressing the integrand in the form $\sec^2 x f(\tan x)$, or otherwise, find a simplified expression for

$$\int \frac{3 \sin^2 x \cos^2 x}{(\cos^3 x + \sin^3 x)^2} dx.$$

$$\frac{1}{1 - \tan^3 x} + C$$



Handwritten solution for the integral:

$$\begin{aligned} \int \frac{3 \sin^2 x \cos^2 x}{(\cos^3 x + \sin^3 x)^2} dx &= \int \frac{3 \sin^2 x \cos^2 x}{\left[\cos^2 x \left(1 + \frac{\sin^3 x}{\cos^3 x} \right) \right]^2} dx = \int \frac{3 \sin^2 x \cos^2 x}{\cos^4 x (1 + \tan^3 x)^2} dx \\ &= \int \frac{3 \sin^2 x \cos^2 x}{\cos^4 x (1 + \tan^3 x)^2} dx = \int \frac{3 + \frac{3}{\tan^3 x}}{(1 + \tan^3 x)^2} d \tan x \\ &\quad \text{BY SUBSTITUTION OR RECOGNITION} \\ &= \int \frac{3 \sec^2 x \tan^3 x (1 + \tan^3 x)^{-2}}{(1 + \tan^3 x)^2} dx = (1 + \tan^3 x)^{-1} + C \\ &= \frac{1}{1 + \tan^3 x} + C \end{aligned}$$