

Answer on Question #45970 – Math – Integral Calculus

Question.

Find the $\int \tan 3x \sec 3x dx$.

Solution.

$$\tan \theta = \frac{\sin \theta}{\cos \theta};$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\begin{aligned}\int \tan 3x \cdot \sec 3x \, dx &= \int \frac{\sin 3x}{\cos 3x} \cdot \frac{dx}{\cos 3x} = \int \frac{\sin 3x}{(\cos 3x)^2} dx = \{y = 3x\} = \frac{1}{3} \int \frac{\sin y}{(\cos y)^2} dy = \\ &= -\frac{1}{3} \int \frac{d(\cos y)}{(\cos y)^2} = \{z = \cos y\} = -\frac{1}{3} \int \frac{dz}{z^2} = \frac{1}{3z} + C = \{z = \cos y\} = \frac{1}{3 \cos y} + C = \\ &= \{y = 3x\} =\end{aligned}$$

$$= \frac{1}{3 \cos 3x} + C, \text{ where } C \text{ is an arbitrary real constant.}$$

Answer.

$$\int \tan 3x \cdot \sec 3x \, dx = \frac{1}{3 \cos 3x} + C$$