

Q31

$$\begin{aligned} & \int \frac{1 + \cos 2x}{\sin^2 2x} dx \\ &= \int \frac{1 + \cos 2x}{1 - \cos^2 2x} dx \\ &= \int \frac{1 + \cos 2x}{(1 + \cos 2x)(1 - \cos 2x)} dx \\ &= \int \frac{1}{1 - \cos 2x} dx \\ &= \int \frac{1}{1 - 1 + 2 \sin^2 x} dx \\ &= \frac{1}{2} \int \csc^2 x dx \\ &= -\frac{1}{2} \cot x + C \end{aligned}$$

Alternate equivalent

$$\begin{aligned} & -\frac{1}{2}(\csc 2x + \cot 2x) \\ &= -\frac{1}{2} \left(\frac{1}{\sin 2x} + \frac{1}{\tan 2x} \right) \\ &= -\frac{1}{2} \left(\frac{1 + \cos 2x}{\sin 2x} \right) \\ &= -\frac{1}{2} \left(\frac{1 + 2 \cos^2 x - 1}{2 \sin x \cos x} \right) \\ &= -\frac{1}{2} \left(\frac{\cos^2 x}{\sin x \cos x} \right) \\ &= -\frac{1}{2} \cot x \end{aligned}$$