

# Section 7 $\int \cos x \cos^3(\sin x) dx$

$$\begin{aligned} & \int \cos^3 u \, du = \int (1 - \sin^2 u) \cos u \, du = \int (1 - w^2) \, dw \\ \uparrow & \hspace{20em} \uparrow \\ u = \sin x & \hspace{15em} w = \sin u \\ du = \cos x \, dx & \hspace{10em} dw = \cos u \, du \end{aligned}$$

$$= w - \frac{w^3}{3} + C = \boxed{\sin(\sin x) - \frac{\sin^3(\sin x)}{3} + C}$$

check The derivative of the proposed answer is

$$\begin{aligned} & \cos(\sin x) \cos x - \sin^2(\sin x) \cos(\sin x) \cos x \\ & = \cos(\sin x) \cos x (1 - \sin^2(\sin x)) \\ & = \cos(\sin x) \cos x \cos^2(\sin x) \\ & = \cos^3(\sin x) \cos x \checkmark \end{aligned}$$