

$$\begin{aligned}
\text{Find } \int \sin^5 x dx &= \int \sin^4 x \cdot \sin x dx \\
&= \int (\sin^2 x)^2 \sin x dx \\
&= \int (1 - \cos^2 x)^2 \sin x dx \\
&= \int (1 - u^2)^2 -1 \cdot du \\
&= \int - (1 - u^2)(1 - u^2) du \\
&= \int - (1 - u^2 - u^2 + u^4) du \\
&= \int - (1 - 2u^2 + u^4) du \\
&= \int (-1 + 2u^2 - u^4) du \\
&= -u + \frac{2u^3}{3} - \frac{u^5}{5} + C \\
&= -\cos x + \frac{2}{3} \cos^3 x - \frac{\cos^5 x}{5} + C
\end{aligned}$$

$$\begin{aligned}
\sin^2 x + \cos^2 x &\equiv 1 \\
\sin^2 x &= 1 - \cos^2 x
\end{aligned}$$

$$\begin{aligned}
u &= \cos x \\
\frac{du}{dx} &= -\sin x \\
-1 \cdot du &= \sin x dx
\end{aligned}$$