

u-Substitution

Substitution Method

Integration by Substitution

An integration method that essentially involves using the chain rule in reverse.

Example: For $\int x\sqrt{5+x^2} dx$ let $u = 5+x^2$.

That means $\frac{du}{2} = x dx$

It follows that

$$\begin{aligned}\int x\sqrt{5+x^2} dx &= \int \sqrt{u} \cdot \frac{1}{2} du \\ &= \frac{1}{2} \int u^{\frac{1}{2}} du \\ &= \frac{1}{2} \cdot \frac{2}{3} u^{\frac{3}{2}} + C \\ &= \frac{1}{3} (5+x^2)^{\frac{3}{2}} + C\end{aligned}$$