

Example 2: Evaluate $\int \tan^{-1} x \, dx$.

Use the following:

$$u = \tan^{-1} x \qquad dv = dx$$

$$du = \frac{1}{1+x^2} dx \qquad v = x$$

Thus

$$\begin{aligned} \int \tan^{-1} x \, dx &= x \tan^{-1} x - \int \frac{x}{1+x^2} \, dx \\ &= x \tan^{-1} x - \frac{1}{2} \int \frac{2x}{1+x^2} \, dx \\ &= x \tan^{-1} x - \frac{1}{2} \ln |1+x^2| + C \\ &= x \tan^{-1} x - \frac{1}{2} \ln (1+x^2) + C \end{aligned}$$