

Evaluate $\int \sin^{-1} x dx$

Let $\sin^{-1} x = t$. Then $x = \sin t$ or $dx = \cos t dt$. Thus,

$$\begin{aligned} I &= \int \sin^{-1} x dx \\ &= \int t \cos t dt \\ &= t \sin t - \int 1(\sin t) dt \\ &= t \sin t - \int \sin t dt \end{aligned}$$

$$= t \sin t + \cos t + C = x \sin^{-1} x + \sqrt{1 - \sin^2 t} + C$$

$$= x \sin^{-1} x + \sqrt{1 - x^2} + C$$