

A comment on Schnell and Mendoza

Schnell and Mendoza [1] derive the interesting formula $\int f^{-1}(y) dy = xf(x) - \int f(x) dx$, where $y = f(x)$. It can also be obtained from the standard A-level 'trick' of treating $\int g(x) dx$ as $\int 1.g(x) dx$. Using this method

$$\int f^{-1}(y) dy = \int 1.f^{-1}(y) dy = yf^{-1}(y) - \int y[f^{-1}(y)]' dy.$$

We note that since $f'(x) = \frac{dy}{dx}$ and $f^{-1}(y) = x$, $[f^{-1}(y)]' = \frac{dx}{dy} = \frac{1}{f'(x)}$, giving $\int f^{-1}(y) dy = xf(x) - \int \frac{y}{f'(x)} dy = xf(x) - \int f(x) dx$, since $\frac{dy}{f'(x)} = dx$.

Reference

1. S. Schnell and C. Mendoza, A formula for integrating inverse functions, *Math. Gaz.*, **84** (March 2000) pp. 103-104.

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