Integration by substitution

If $u = g(x)$ is a continuous and differentiable function in the interval I then

$$\int f(g(x))g'(x)\,\mathrm{d}x = \int f(t)\,\mathrm{d}t$$

Useful

1. to simplify the integrand.
2. when the integrand involve irrational fractions.
3. when a particular expression is repeated.

Integration by substitution

Example

$$\int e^{\sqrt{x}}\,dx = \int e^{t}\,2t\,dt = \cdots$$

Do the substitution:

$$\begin{aligned} & t = \sqrt{x} \\ \Rightarrow \quad & dt = \frac{1}{2\sqrt{x}}\,dx \\ \Rightarrow \quad & 2t\,dt = dx \end{aligned}$$