

substitution

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Consider the indefinite integral with integrand $(2x + 3)^{100}$. We make the substitution

$$u = 2x + 3 \implies \frac{du}{dx} = 2 \text{ i.e. } dx = \frac{1}{2}du$$

and we calculate the integral as

$$\int (2x + 3)^{100} dx = \int u^{100} \cdot \frac{1}{2} du$$

$$= \frac{1}{2} \int u^{100} du$$

$$= \frac{1}{202} (2x + 3)^{101} + C$$

You can double check via differentiation:

$$\frac{d}{dx} \left[\frac{1}{202} (2x + 3)^{101} + C \right] = \frac{101}{202} (2x + 3)^{100} \cdot 2 = (2x + 3)^{100}$$

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