

Integrating by substitution for $\ln x$ and e^x

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ES:

How do we integrate $\int \frac{1}{4x-1} dx$
and $\int e^{3x+1} dx$?

What do we know?

$$\int \frac{1}{x} dx = \ln|x| + c$$

$$\int e^x dx = e^x + c$$

Log rule of integration

$$\int \frac{1}{u} du = \ln|u| + c$$

ex1

$$\int \frac{2}{x} dx = 2 \int \frac{1}{x} dx \\ = \boxed{2 \ln|x| + c}$$

ex2

Substitution

$$\int \frac{1}{4x-1} dx = \int \frac{1}{4x-1} \left(\frac{1}{4} \right) (4 dx) \quad \begin{array}{l} u = 4x-1 \\ du = 4 dx \end{array} \\ = \frac{1}{4} \int \frac{1}{u} du \\ = \frac{1}{4} \ln|u| + c \\ = \boxed{\frac{1}{4} \ln|4x-1| + c}$$

