$$\frac{dy}{dt} = ky$$

$$\int \frac{1}{y}\frac{dy}{dt}\,dt = \int k\,dt$$

$$\int \frac{1}{y}\,dy = \int k\,dt$$

$$\ln|y| + C_1 = kt + C_2$$

$\log_a b = k$ means $a^k = b$

$$\ln_e|y| = kt + C$$

$$|y| = e^{kt+C}$$

$$|y| = e^C e^{kt}$$

$A = \pm e^C$

Depending on the initial condition

$$y = \pm e^C e^{kt}$$

$$y = Ae^{kt}$$

$y = Ae^{kt}$