

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

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

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

$$\ln|y| + c_1 = kt + c_2$$

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

$$\log_x b = k$$
$$a^k = b$$

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

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

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

$$y = A e^{kt}$$

Let $A = \pm e^c$
Depending on
the initial
condition

$$5 = A e^{k(0)}$$

$$\text{at } t=0, y=5$$

$$5 = A(1)$$

$$\text{at } t=1, y=10$$

$$y = 5e^{kt}$$

$$y = 5e^{t \ln 2}$$

$$10 = 5e^k$$

$$y = 5(e^{\ln 2})^t$$

$$2 = e^k$$

$$y = 5 \cdot 2^t$$

$$k = \ln 2$$