

Examples:

1. $\frac{dy}{dx} = ay$, a is a constant

$$\Rightarrow \frac{dy}{y} = a dx \Rightarrow \int \frac{dy}{y} = a \int dx$$

$\ln|y| = ax + C \Rightarrow y = e^C e^{ax} = k e^{ax}$ is the general solution.
 $y(0) = k$. \uparrow
constant.

When $a > 0$, this differential equation describes exponential growth.

When $a < 0$, this differential equation describes exponential decay.

2. $\frac{dy}{dx} = by^2$ $\frac{dy}{y^2} = b dx$

$$-\frac{1}{y} = \int \frac{dy}{y^2} = \int b dx = bx - C \Rightarrow y(x) = \frac{1}{C - bx}$$

$y(0) = 1/C$. $b > 0$.

$b < 0$

