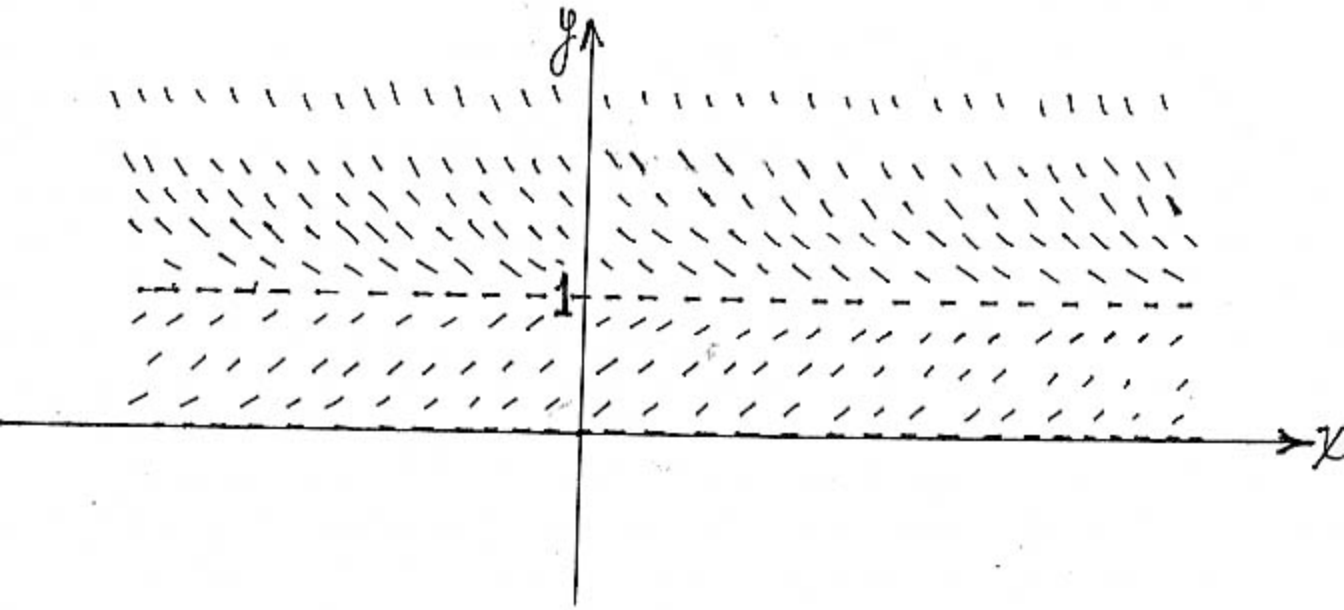
A direction field (or slope field) for a first order differential equation.

Consider the differential equation

$$\frac{dy}{dx} = y(1-y).$$



$$\frac{dy}{y(1-y)} = dx \quad \Rightarrow \quad \int -\frac{dy}{y-1} + \int \frac{dy}{y} = \int dx$$

$$-\ln(y-1) + \ln y = x + C \quad \Rightarrow \quad \ln\left(\frac{y}{y-1}\right) = x + C$$

$$\Rightarrow \quad \frac{y}{y-1} = Ke^x \quad \Rightarrow \quad y = \frac{Ke^x}{Ke^x - 1} = \frac{1}{1 - \frac{1}{K}e^{-x}}, \quad K \neq 0.$$