$$\frac{dy}{dx} = f(x)\, g(y)$$

$$\int \frac{1}{g(y)}\, dy = \int f(x)\, dx$$

Solve the differential equation $\frac{dy}{dx} = \frac{y+1}{x}$

$$\frac{dy}{dx} = \frac{y+1}{x}$$

$$\int \frac{1}{y+1}\, dy = \int \frac{1}{x}\, dx$$

$$\ln|y+1| = \ln|x| + C$$

$$\ln|y+1| = \ln|x| + \ln C_1$$

$$\ln|y+1| = \ln|C_1 x|$$

$$y+1 = C_1 x$$

$$y = C_1 x - 1$$