

**Objective:** Recognize and solve differential equations that can be solved by separation of variables.

Find the general solution of the differential equation  $xy' = y$ .

**ANSWER:**

$$xy' = y$$

$$y' = \frac{y}{x}$$

$$\frac{y'}{y} = \frac{1}{x}$$

$$\int \frac{y'}{y} dx = \int \frac{1}{x} dx$$

$$\int \frac{1}{y} dy = \int \frac{1}{x} dx \quad \text{Remember: } (dy = y'dx)$$

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

$$e^{\ln y} = e^{(\ln x + C)}$$

$$y = e^{\ln x} + e^C \quad \text{Remember: } (e^C \text{ is a constant so } e^C = C)$$

$$y = xe^C$$

$$y = Cx$$