

- 1.
- 5
- Find an implicit general solution to

$$\frac{dy}{dx} = \frac{2xe^y}{y}$$

Separating gives

$$\int ye^{-y} dy = \int 2x dx$$

$$u = y \quad dv = e^{-y} dy$$

$$du = dy \quad v = -e^{-y}$$

so

$$-ye^{-y} + \int e^{-y} dy = x^2 + C$$

$$-ye^{-y} - e^{-y} = x^2 + C$$

- 2.
- 4
- Find a general solution to

$$x' = 2x + 5e^t$$

Standard Form

$$x' - 2x = 5e^t$$

Integrating Factor

$$\mu(t) = e^{-2t}$$

so

$$e^{-2t} x' - 2e^{-2t} x = 5e^{-t}$$

$$(e^{-2t} x)' = 5e^{-t}$$

$$e^{-2t} x = \int 5e^{-t} dt = C - 5e^{-t}$$

$$x = e^{2t} (C - 5e^{-t})$$

- 3.
- 1
- On what interval does

$$y' - \frac{y}{3+t} = e^{t^{2018}}, \quad y(0) = 5$$

have a unique solution?

$$(-3, \infty)$$