

## Solving 1st order linear ODEs

- Given  $y'(x) + p(x)y(x) = q(x)$
- Find the integrating factor

$$\mu(x) = e^{\int p(x) dx}$$

- The solution follows from

$$\mu(x)y(x) = \int \mu(x)q(x) dx$$

(Don't forget your constant of integration!)

- Or, if you are given an initial condition...

$$\mu(x)y(x) = \mu(x_0)y(x_0) + \int_{x_0}^x \mu(t)q(t) dt$$

Suppose  $p(x)$  and  $q(x)$  are continuous on an interval  $(a, b)$  containing  $x_0$ . Then for any choice of initial value  $y_0$ , the linear IVP

$$\frac{dy}{dx} + p(x)y = q(x), \quad y(x_0) = y_0$$

has a unique solution on the entire interval  $(a, b)$ .