1st Order Linear Differential Equations

Definition

A first-order linear differential equation is one that can be put into the form

$$y' + P(x)y = Q(x)$$

where P and Q are functions of x.

Solving the Equation

- We are going to multiply both side of the equation with an *integrating factor*, $I(x)$.
- We shall choose an $I(x)$ that makes the left side equation to the derivative of the product $I(x)y$

$$I(x)(y' + P(x)y) = I(x)Q(x)$$

$$(I(x)y)' = I(x)Q(x)$$

- We can then integrate both sides to get

$$I(x)y = \int I(x)Q(x) + C$$

This will be integrable (or so we hope)

Deriving $I(x)$

- The general solution for $I(x)$ is:

$$I(x) = e^{\int P(x)\,dx}$$