

Integrating Factor for Constant Rate

this is our last look at the first order linear differential equation.

recall the product rule :

$$\frac{d}{dt}(My) = \frac{dy}{dt}M - a(t)My = Mq(t)$$

if $a(t) = 2t$, so, in that case $M = e^{-t^2}$

$$M(t)y(t) = y(0) + \int_0^t M(s)q(s) ds$$

dividing by $M(t)$, we get

$$y(t) = e^{\int a(t) dt} y(0) + \int_0^t e^{\int_s^t a} q(s) ds$$