

# MATH 228 Assignment 1

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## 1. Find the solution of the initial value problem

$$y' - y = 2te^t, \quad y(0) = 1.$$

If we multiply both sides by some function  $\mu = \mu(t)$ , we get

$$\mu y' - \mu y = 2\mu te^t. \tag{1}$$

And if we choose a  $\mu$  such that

$$\frac{d\mu}{dt} = -\mu,$$

the left side of equation (1) will be equal to  $\frac{d}{dt} \mu y$ .

$$\frac{d\mu}{dt} = -\mu$$

$$\frac{1}{\mu} d\mu = -dt$$

$$\ln|\mu| = -t + C_1$$

$$|\mu| = e^{-t} e^{C_1}$$

$$\mu = ce^{-t}$$

We can discard the constant  $c$  since we don't need the most general expression for  $\mu$ . Next, we substitute  $\frac{d}{dt} \mu y$  in for  $\mu y' - \mu y$  in equation (1).

$$\frac{d}{dt} \mu y = 2\mu te^t$$

$$\frac{d}{dt} e^{-t} y = 2t$$

$$e^{-t} y = t^2 + C$$

$$\boxed{y = e^t t^2 + Ce^t}$$