

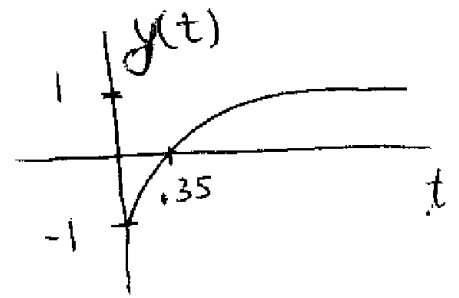
$$1a) \frac{dy}{dt} + 2y = 2x, \quad x = u(t) \quad y(0) = -1$$

$$y(t) = e^{-2t} y(0) + \int_0^t 2e^{-2(t-\lambda)} x(\lambda) d\lambda$$

$$= -e^{-2t} + 2 \int_0^t e^{-2t} e^{2\lambda} d\lambda$$

$$= -e^{-2t} + e^{-2t} e^{2\lambda} \Big|_0^t$$

$$= -e^{-2t} + 1 - e^{-2t} = \boxed{1 - 2e^{-2t} \quad t \geq 0}$$



$$b) \frac{dy}{dt} - 2y = 2x, \quad x(t) = u(t), \quad y(0) = -1$$

$$y(t) = e^{2t} y(0) + \int_0^t 2e^{2(t-\lambda)} x(\lambda) d\lambda$$

$$= -e^{2t} + \frac{2e^{2t}}{-2} e^{-2\lambda} \Big|_0^t$$

$$= -e^{2t} - e^{2t} (e^{-2t} - 1) \quad t \geq 0$$

$$= -1 \quad t \geq 0$$

