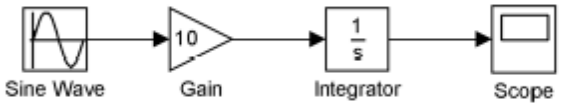
Problem.1 Solve the following problem for $0 \le t \le 13$

$$\frac{dy}{dt} = 10\sin t \quad \text{y(0)=0}$$

Solution: Exact solution is y(t)=10(1-cos t)



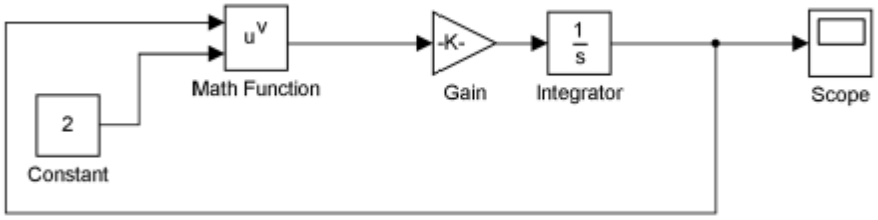
Problem.2 The second order irreversible elementary reaction $2A \longrightarrow B$ is occurring batch reactor.

Kinetic equation is

$-r_A = -\frac{dC_A}{dt} = kC_A^{\,2}$ Where $k = 0.005\frac{lt}{mol.s}$ and initially $C_{A_0} = 10\frac{mole}{lt.s}$

Draw a concentration profile of component A w.r.t time.

Solution:



Assignment Problem

A stirred-tank blending process with a constant liquid holdup of 2 m^3 is used to blend two streams whose densities arc both approximately 900 kg/m^3, the density does not change during mixing.

Assume that the process has been operating for a long period of time with flow rates of w1 = 500 kg/min and w2= 200 kg/min. and feed compositions (mass fractions) of x1 = 0.4 and x2 = 0.75. With the steady-state value of x0= 0.5,

(a) Suppose that w1 change suddenly from 500 to 400 kg/ min and remains at the new value. Determine an expression for x(t) and plot it.

(b) Repeat part (b) for the case where w2 (instead of w1) changes suddenly from 200 to 100 kg/min and remains there.

(c) Repeat part (c) for the case where x1 suddenly changes from 0.4 to 0.6.

$$\frac{dx}{dt} = \frac{\frac{w1 * x1 + w2 * \mathrm{x}\,2}{w1 + w2} - x}{\tau}$$

Initial condition x_0=0.5