HW Assignment 9

Due date: Thursday 26/5/2016

Question 1

Show that for the matrix

$$A=\begin{pmatrix} \sigma & \omega \\ -\omega & \sigma \end{pmatrix}$$

we have that

$$e^{At}=\begin{pmatrix} e^{\sigma t}\cos(\omega t) & e^{\sigma t}\sin(\omega t) \\ -e^{\sigma t}\sin(\omega t) & e^{\sigma t}\cos(\omega t) \end{pmatrix}$$

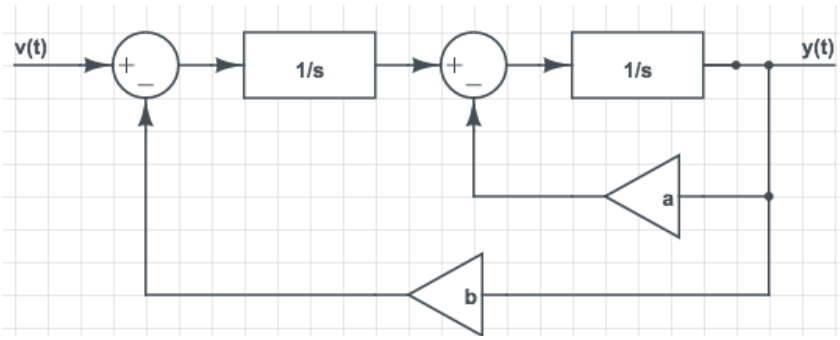
Question 2

Show that if A and B are constant square matrices then

$$\exp\left(\begin{bmatrix} A & 0 \\ 0 & B \end{bmatrix} t\right)=\begin{pmatrix} e^{At} & 0 \\ 0 & e^{Bt} \end{pmatrix}$$

Question 3

Consider the following system



1. What is the transfer function of the system?
2. find the corresponding differential equation.
3. Assuming $a=5, b=6$. find the state space representation of the differential equation.
4. Extract the output $y(t)$.