HW Assignment 8

Due date: Thursday 19/5/2016

Question 1

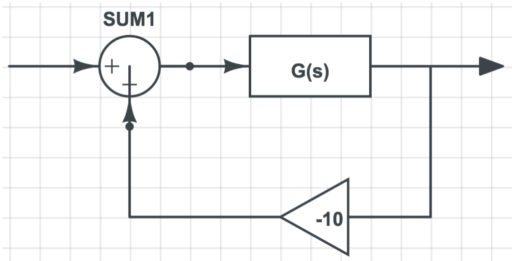
Sketch asymptotic Bode amplitude plots for the following transfer functions

1. $\dfrac{s}{(s+100)(s+1000)}$.
2. $\dfrac{(s+10)(s+100)}{(s+1000)^2(s+10000)}$.
3. $\dfrac{(s+10)^2(s+1000)}{s^2(s+100)}$.

Question 2

consider the system *g*, whose transfer function is $G(s)=\dfrac{1}{s+\omega_c}$.

1. What is the condition on ω_c so that the system will be stable?
2. Assuming $\omega_c = 10$, sketch the asymptotic Bode amplitude plot of *g.*
3. what is the transfer function of the feedback system shown in the plot below? Sketch it's Bode amplitude plot on the same axes.

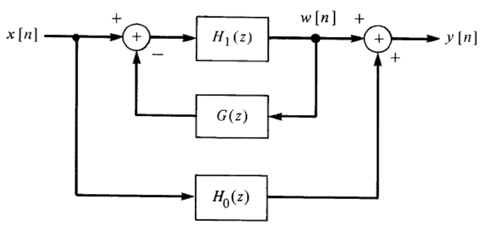


4. Assuming $\omega_c = -10$, we'd like to stabilize the system using a proportional feedback *k.* What *k*'s would stabilize the system?

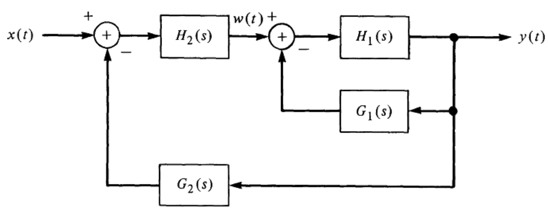
Question 3

What are the transfer functions of the following systems?

1.



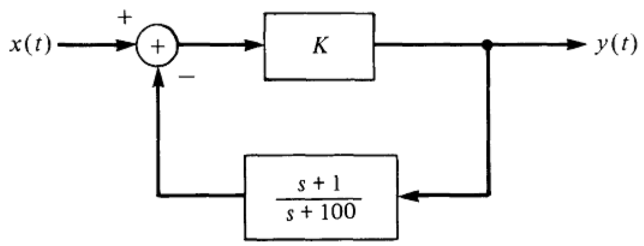
2.



Question 4

Find the closed-loop zeros and poles of the system below for the following values of K:

1. $K = 0.01$ 2. $K = 1$ 3. $K = 10$ 4. $K = 100$

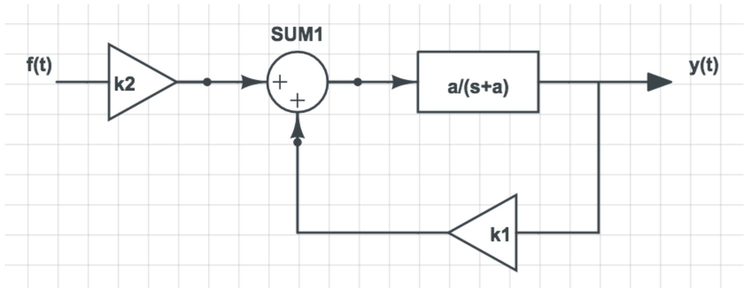


Question 5

The signal $y(t)$ is the temperature of a big tank of liquid. It is controlled by the signal $f(t)$, trough the transfer function $Y(s) = \dfrac{a}{s+a} F(s)$, where $a > 0$ is a constant linked to the mass of the liquid.

1. What is the step response of the system?

The system is now improved by using a proportional feedback k_1 and a global gain k_2.



2. For what values of k_1 is the system stable?
3. What should be the value of k_2 which induces the right temperature?
4. What values of k_1 would quicken the systems response to the control signal?