## Homework 11: due 04/20/18 EE 324: Signals and Systems II

## 1 Closed loop systems

Consider the block diagram as shown in the figure below. Calculate the closed-loop transfer function T as well as its sensitivity with respect to G, i.e.,  $S_G^T$ , when

1) 
$$G(s) = \frac{1}{s+1}, H(s) = 1$$
  
2)  $G(s) = \frac{1}{s+1}, H(s) = -2$ 

3) 
$$G(s) = \frac{1}{s^2 + 2s}, H(s) = 1$$



## 2 Routh-Hurwitz stability criterion

1. Use the Routh-Hurwitz stability criterion to determine the number of roots in the left half plane

a) 
$$s^4 + 2s^2 + 1 = 0$$

b) 
$$s^4 + s^3 + s + 0.5 = 0$$

c)  $s^4 + 2s^3 + 3s^2 + 2s + 4 = 0$ 

2. Use the Routh-Hurwitz stability criterion to determine the range of K such that all the roots of

$$s^3 + s^2 + s + K = 0$$

are in the left half plane.