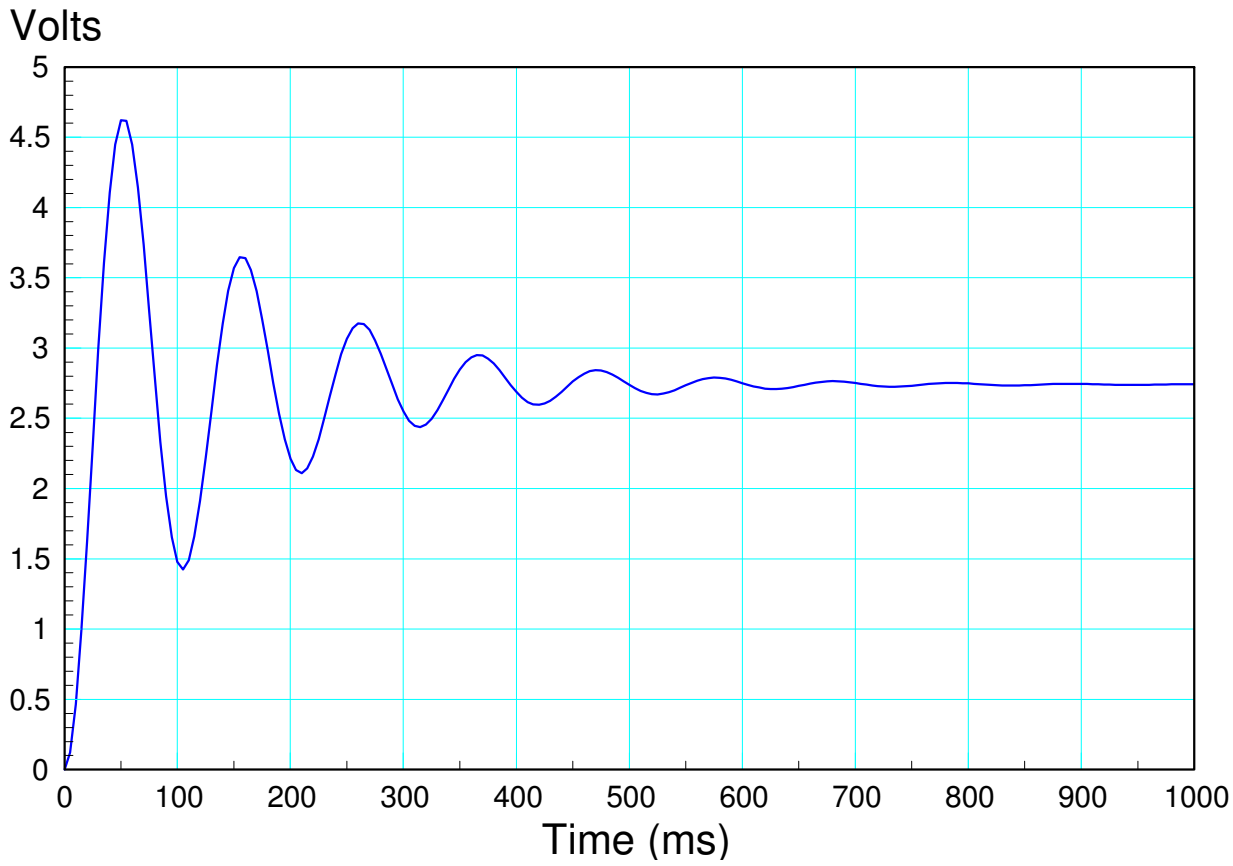
ECE 461/661 - Test #2: Name _____

Feedback and Root Locus - Fall 2020

1) Determine the system with the following step response

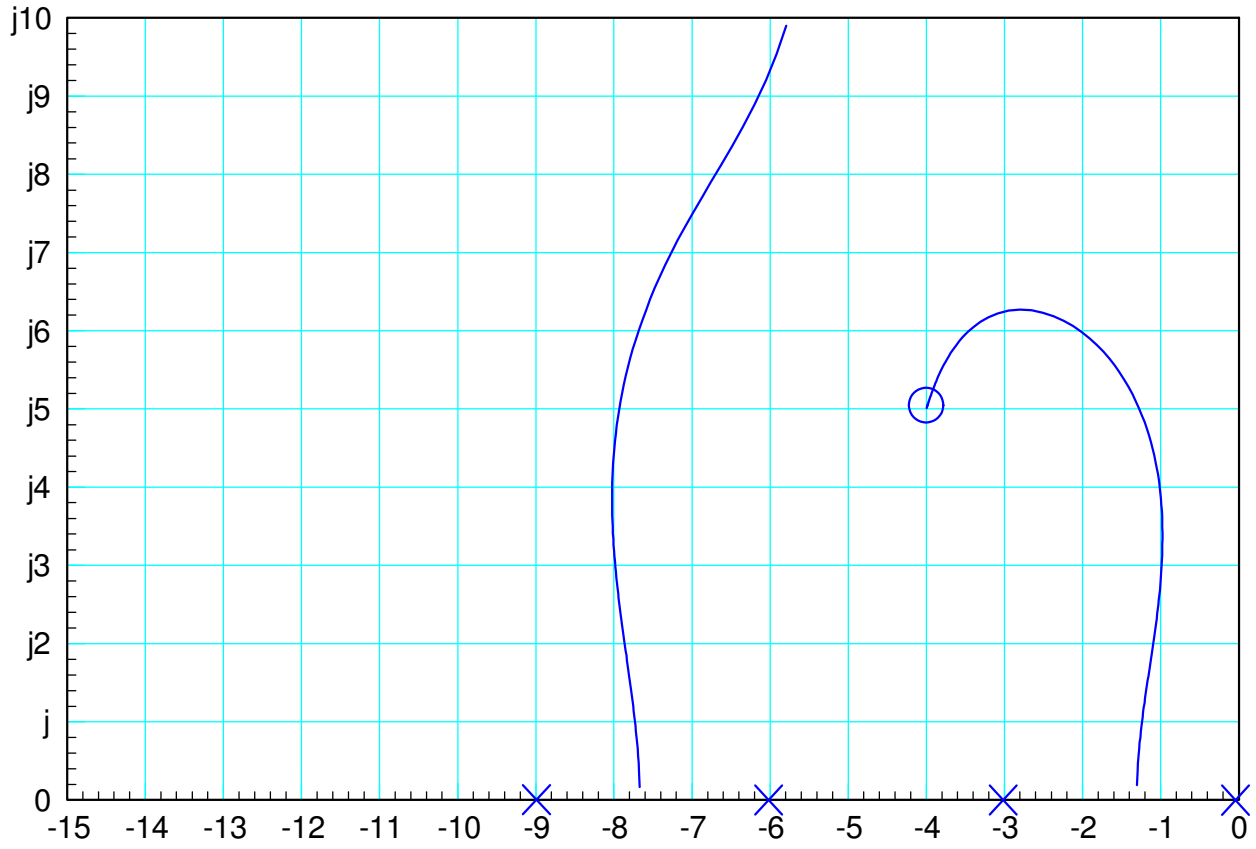


2) The root locus of G(s) is shown below.

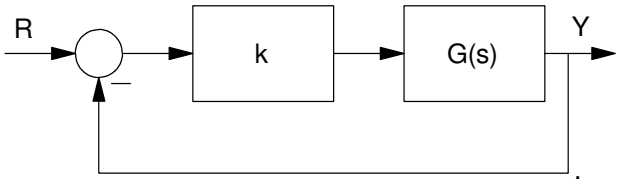
$$G(s) = \left(\frac{100(s+4+j5)(s+4-j5)}{s(s+3)(s+6)(s+9)} \right)$$

Determine the following

- Approach angle to the zero at -4 + j5
- The breakaway point (approx)
- The gain, k, at the breakaway point, and
- The asymptotes (number, angle, intercept)



3) Design a gain compensator (K(s) = k) so that the feedback system has 10% overshoot for a step input.



Also determine

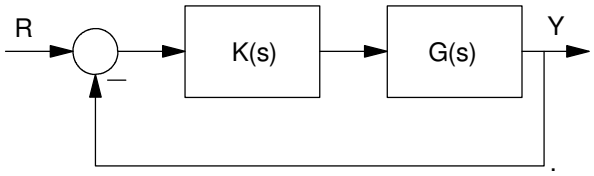
- The resulting error constant, Kp,
- The closed-loop dominant pole, and
- The step response of the closed-loop system (Matlab plot OK for this)

Assume

$$G(s) = \left(\frac{100}{(s+1)(s+3)(s+6)(s+9)} \right)$$

4) Design a compensator, K(s), so that the closed-loop system has

- No error for a step input
- A 2% settling time of 3 seconds
- 10% overshoot for a step input.



$$G(s) = \left(\frac{100}{(s+1)(s+3)(s+6)(s+9)} \right)$$

Plot the step response of the resulting closed-loop system

5) Design a circuit to implement K(s)

$$K(s) = \left(\frac{200(s+3)(s+5)}{s(s+14)} \right)$$