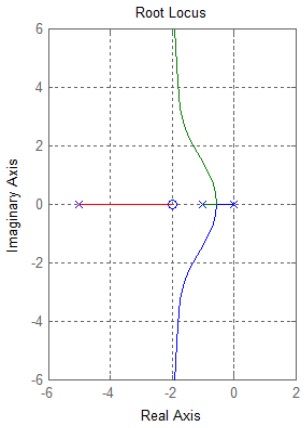
ESE 406/505 & MEAM 513 – 2011-Apr-18 – Quiz – Name:_____

- Choose the one best answer for each question by circling the letter.
- A correct answer is worth 2 points.
- No answer is worth 0 points.
- An incorrect answer is worth -1 point. Random guessing will lower your score, on average.



1. The root locus on K shown at right corresponds to which characteristic equation?

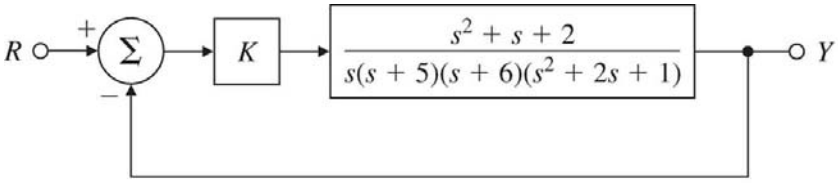
   A. $\Delta_{CL}(s) = s(s+1)(s+5) + K = 0$

   B. $\Delta_{CL}(s) = s(s+1)(s+5) + K(s+2) = 0$

   C. $\Delta_{CL}(s) = 5(s+2) + Ks(s+1) = 0$

   D. $\Delta_{CL}(s) = s(s+1) + 2K(s+5) = 0$

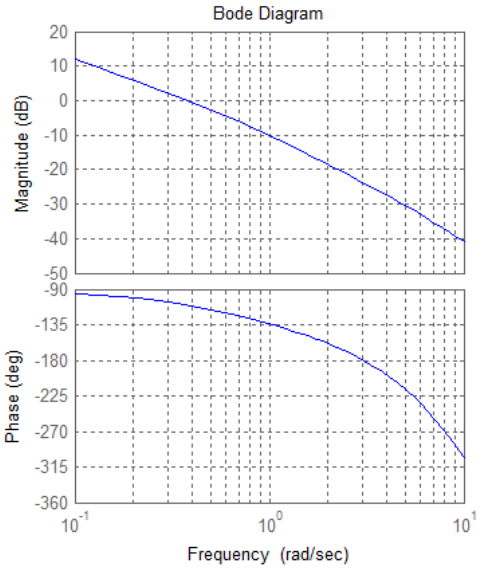
2. For the system shown at right, which of the following is MOST CORRECT about the behavior of the closed-loop roots in the limit as $K \to \infty$?



   A. Three of the roots converge to the origin (poles at the origin are required to balance infinite gain).
   B. Three of the roots approach infinity along straight, equally azimuthally spaced asymptotes
   C. Two of the roots converge to -5.5, which is the average value of the two first-order poles in the open loop transfer function.
   D. Two of the roots approach infinity along straight, equally azimuthally spaced asymptotes.

3. A system is designed with a very conservative gain margin of just under 12dB. Which of the following statements is MOST ACCURATE about the closed-loop stability of the actual system?
   A. If the actual gain of the loop transfer function is greater than 12dB at any frequency, the closed-loop system will be unstable.
   B. If the actual gain of the loop transfer function is less than -12dB at any frequency, the closed-loop system will be unstable.
   C. If the actual gain of the system is larger than expected by a factor of 4 or more, the closed-loop system will be unstable.
   D. If the actual gain of the system is smaller than expected by a factor of 4 or more, the closed-loop system will be unstable.

4. In the bode plot shown in the figure at right, the phase margin is approximately...
   A. ...70 deg
   B. ...45 deg
   C. ...3.0 rad/sec
   D. ...0.4 rad/sec



5. The gain margin shown in the figure is approximately...
   A. 36 dB
   B. 24 dB
   C. 12 dB
   D. 6 dB