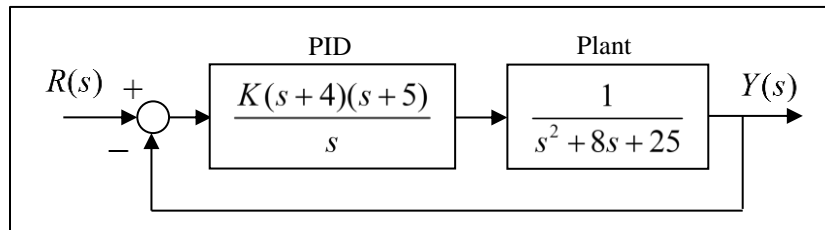


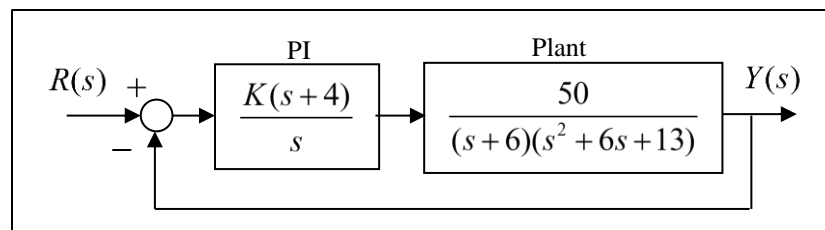
Introductory Control Systems
Exercises #14 – Root Locus Diagrams

For each of the closed-loop systems shown below, *sketch* the root locus diagram for $K \geq 0$. *Identify* the locations where $K=0$ and *indicate* the directions of *increasing* K along the branches. Also, *indicate* the approximate locations of any break points.

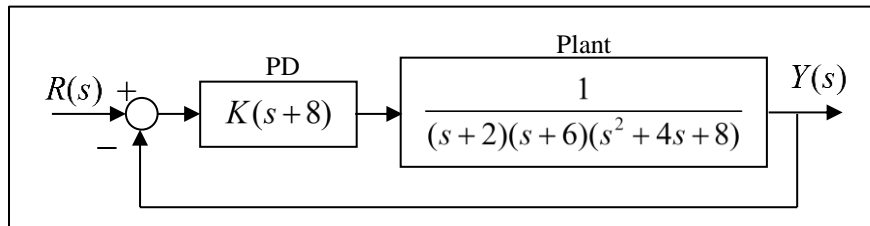
1. A *proportional/integral/derivative* (“PID”) controller is used to control a 2nd order plant with negative unity feedback as shown. *Sketch* the root locus diagram.



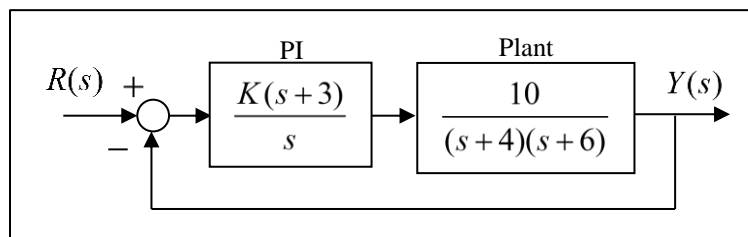
2. A *proportional/integral* (“PI”) controller is used to control a 3rd order plant with negative unity feedback as shown. *Sketch* the root locus diagram.



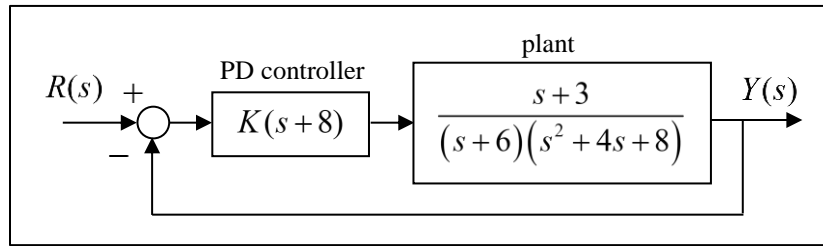
3. A *proportional/derivative* (“PD”) controller is used to control a 4th order plant with negative unity feedback as shown. *Sketch* the root locus diagram.



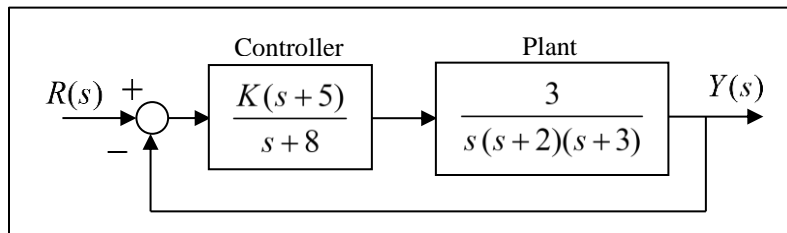
4. A *proportional/integral* (“PI”) controller is used to control a 2nd order plant with negative unity feedback as shown. *Sketch* the root locus diagram.



5. A *proportional/derivative* (“PD”) controller is used to control a 3rd order plant with negative unity feedback as shown. *Sketch* the root locus diagram.



6. A *phase-lead* controller is used to control a 3rd order plant with negative unity feedback as shown. *Sketch* the root locus diagram.



7. A *proportional/integral/derivative* (“PID”) controller is used to control a 3rd order plant with negative unity feedback as shown. *Sketch* the root locus diagram.

