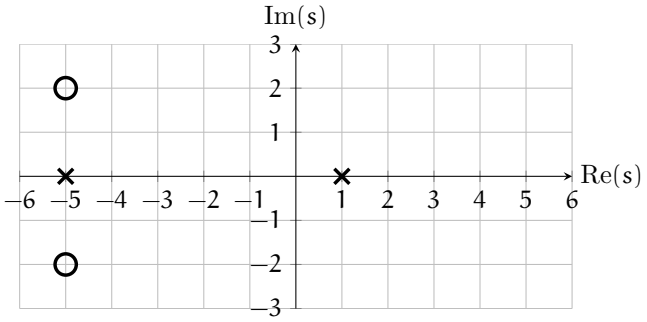
05.4 rlocus.exe Exercises for Chapter 05 rlocus

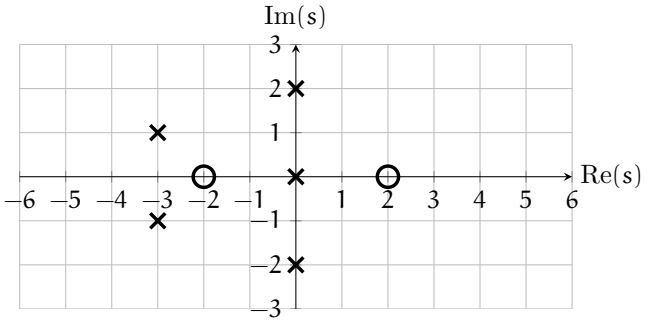
Exercise 05.1 burritosteve

Given the open-loop pole-zero plots below, *sketch the root locus plots* (use this sheet) for positive controller gain K.

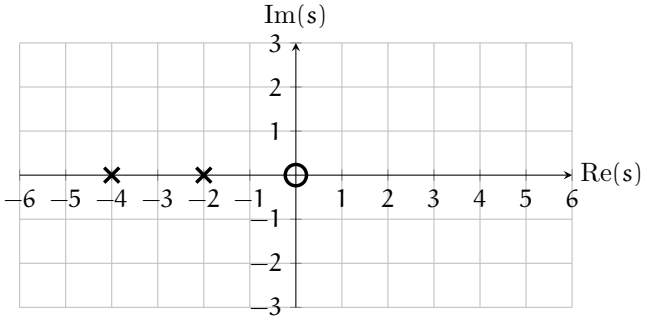
a.



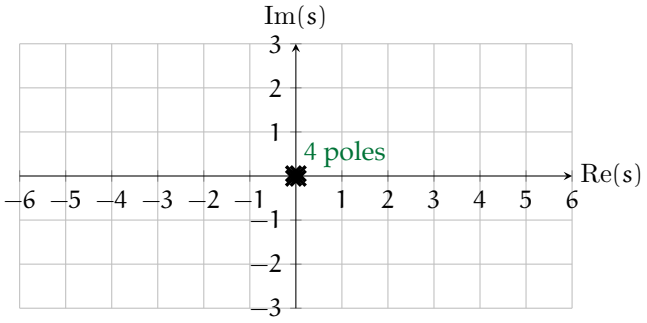
b.



c.



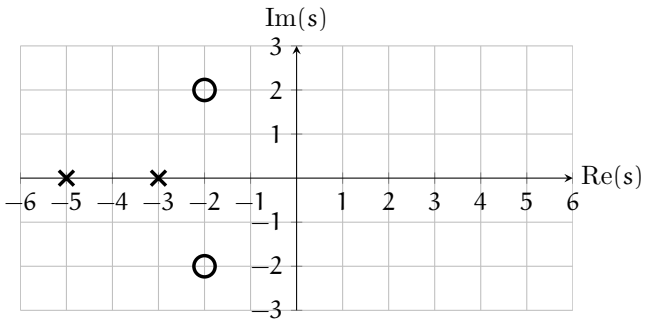
d.



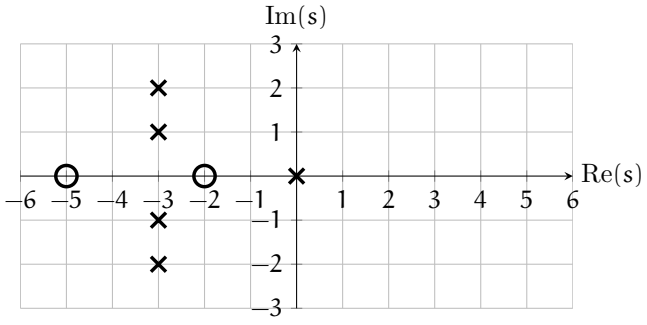
Exercise 05.2 dunnage

Given the open-loop pole-zero plots below, *sketch the root locus plots* (use this sheet) for positive controller gain K.

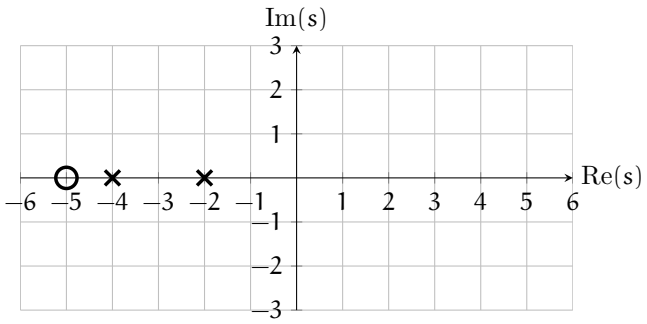
1.



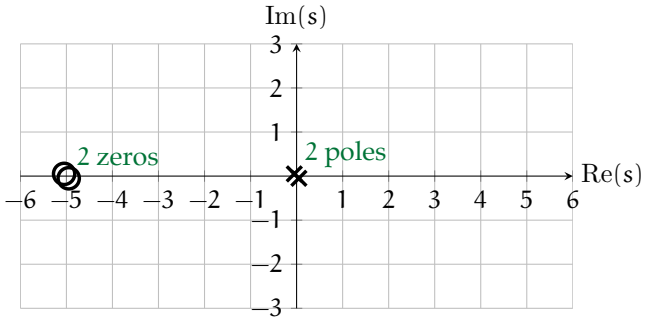
2.



3.


Im(s)
Re(s)
3
2
1
−1
−2
−3
−6 −5 −4 −3 −2 −1 1 2 3 4 5 6

4.


Im(s)
Re(s)
2 zeros
2 poles
3
2
1
−1
−2
−3
−6 −5 −4 −3 −2 −1 1 2 3 4 5 6

06 rldesign

In root locus design, our task is to place the dominant closed-loop poles such that the closed-loop system

1. is stable (Chapter 02 stab),
2. has desirable transient response performance characteristics (Chapter 03 trans), and
3. has desirable steady-state response characteristics (Chapter 04 steady).

Several types of controllers can be designed using these techniques. The most basic is gain control (Lec. 06.2 rldesign.P), which gives us a single parameter—the loop gain—for controller design. The others we consider here are of two main types: proportional-integral-derivative (PID) and proportional-lead-lag. The two are quite similar, but the latter can be implemented with passive circuits, whereas the former require active circuits.