Plot the root locus plots for each of the systems below, in the order given. This will provide essential extra practice at creating the plots, and also help to illustrate the effect of different roots in the D and N polynomials.

As you prepare each plot, find the answers to the following usual questions:

a) For what range of K (if any) is the system stable?

b) For what range(s) of K (if any) is the system homogeneous response nonoscillatory?

c) For what K does the system have the fastest settling time, and what is that settling time?

d) **Then, before creating the next plot, look at the change in the characteristic equation compared to the one you've just finished, and try to predict the effect it will have**

1. $$\lambda + 1 + K = 0$$

2. $$(\lambda + 1)(\lambda + 3) + K = 0$$

3. $$(\lambda - 1)(\lambda + 1)(\lambda + 3) + K = 0$$

4. $$(\lambda - 1)(\lambda + 2)(\lambda + 3) + K = 0$$

5. $$(\lambda - 1)(\lambda + 2 + i)(\lambda + 2 - i) + K = 0$$

6. $$(\lambda + 1)(\lambda + 2 + i)(\lambda + 2 - i) + K = 0$$

7. $$(\lambda + 1)(\lambda + 2 + i)(\lambda + 2 - i) + K(\lambda + 4) = 0$$

8. $$(\lambda + 4)(\lambda + 2 + i)(\lambda + 2 - i) + K(\lambda + 1) = 0$$

9. $$(\lambda + 5)(\lambda + 2 + i)(\lambda + 2 - i) + K(\lambda + 1) = 0$$

10. $$(\lambda + 6)(\lambda + 2 + i)(\lambda + 2 - i) + K(\lambda + 1) = 0$$