

Test: Stability and Performance Analysis

1. Consider the autonomous system

$$\dot{x} = \begin{bmatrix} -1 & 2 \\ -2 & -1 \end{bmatrix} x.$$

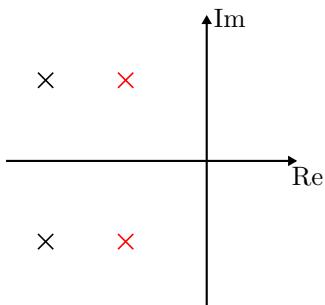
Determine if the system is stable.

2. Consider the system

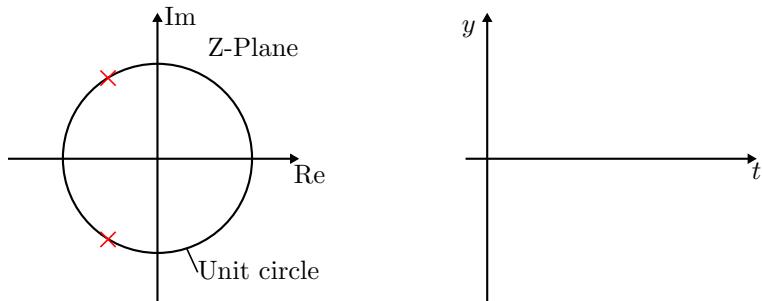
$$x_{k+1} = \begin{bmatrix} 0.5 & 0.1 \\ 0 & 0.3 \end{bmatrix} x_k.$$

Determine if the system is stable.

3. The poles of two systems are shown in the following figure. Which system has the largest overshoot (red/black)?



4. Sketch the impulse response of the discrete system with poles illustrated in the figure below.



5. What is the damping ration of a system with the poles illustrated below?

