



Root Locus Report

Linear Control

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Overview

Root locus is a plot of the roots (or poles) of the closed c/c equation as a function of a variable parameter K (system's gain), and K varies from 0 to infinity.

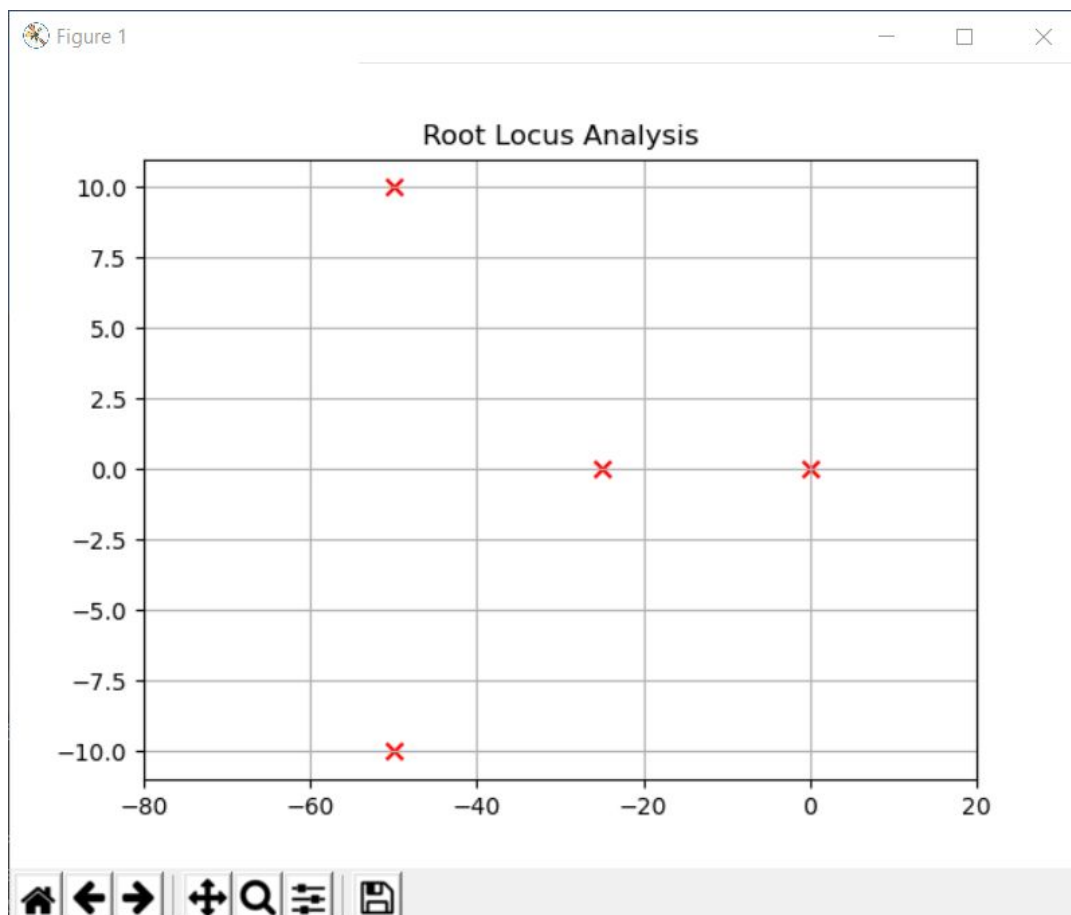
Requirement

Given the following open loop transfer function with four poles at $S = 0$, $S = -25$, $S = -50 + j 10$ and $S = -50 - j 10$ and no zeroes.

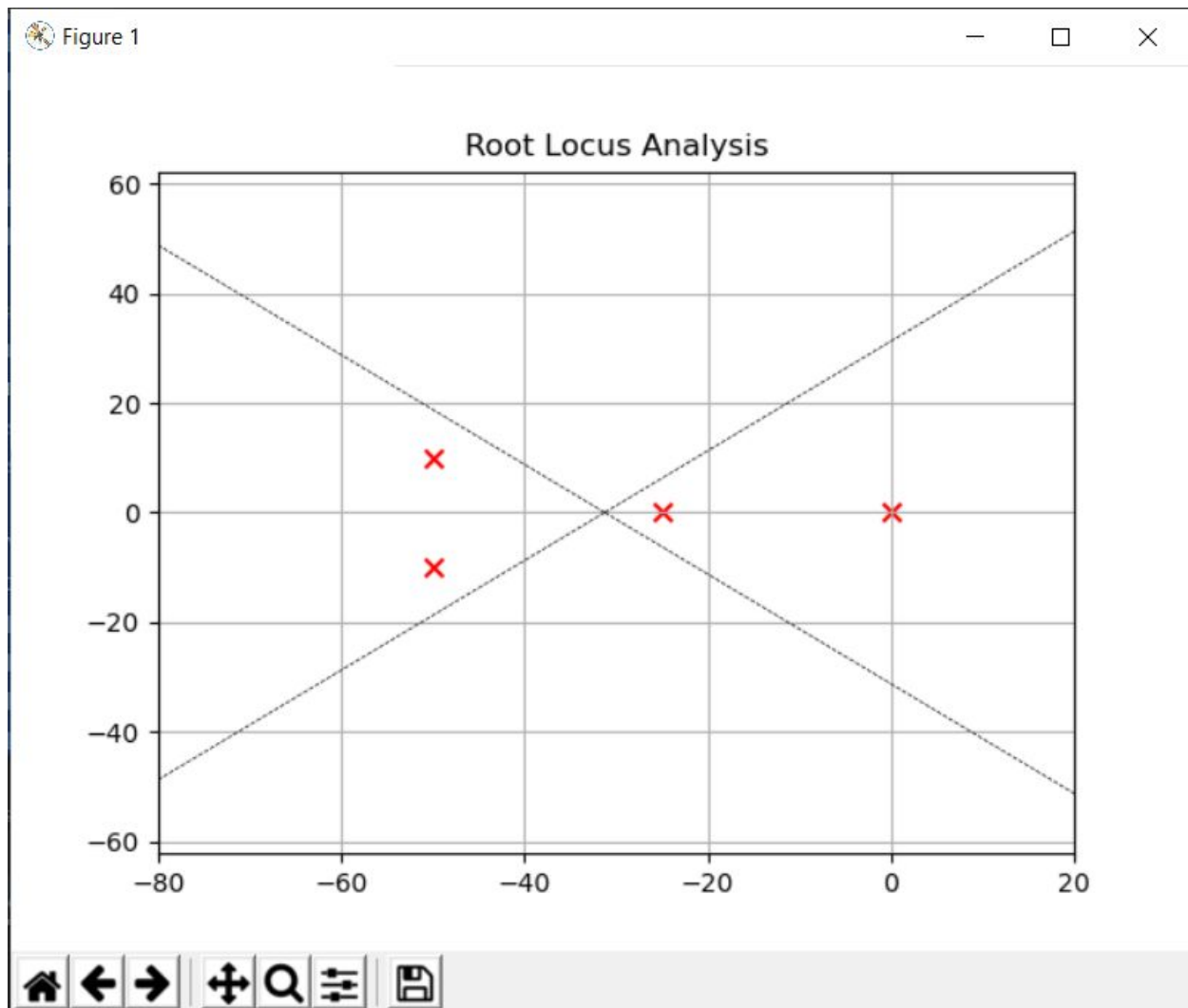
Write a program to draw the root locus following the rules.

Steps

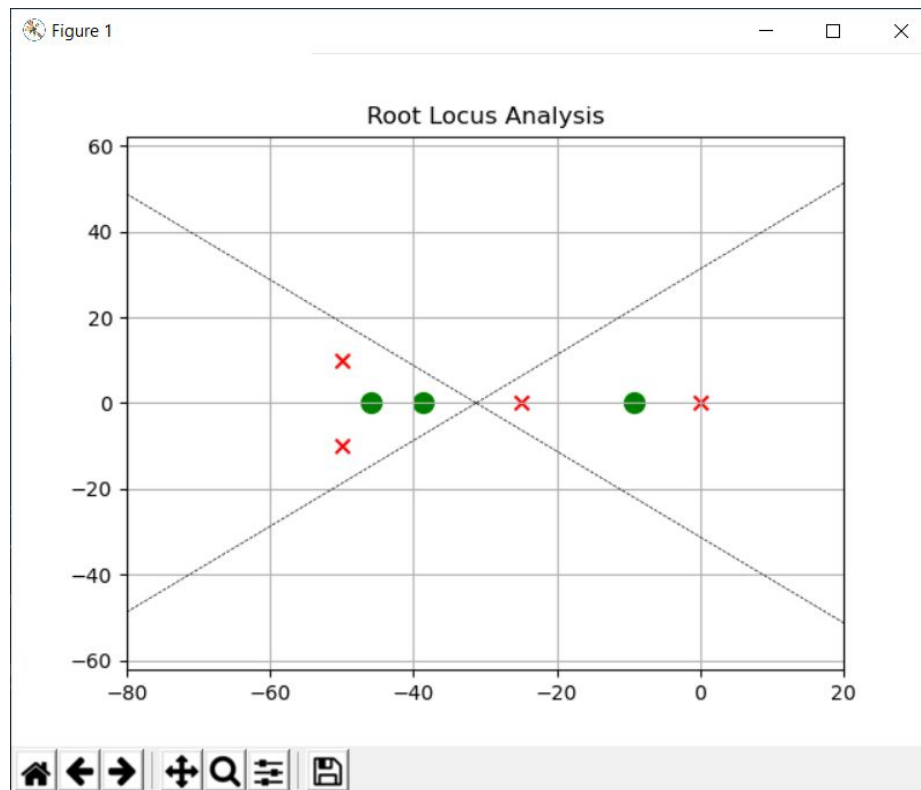
1. Locate poles and zeros on plane:



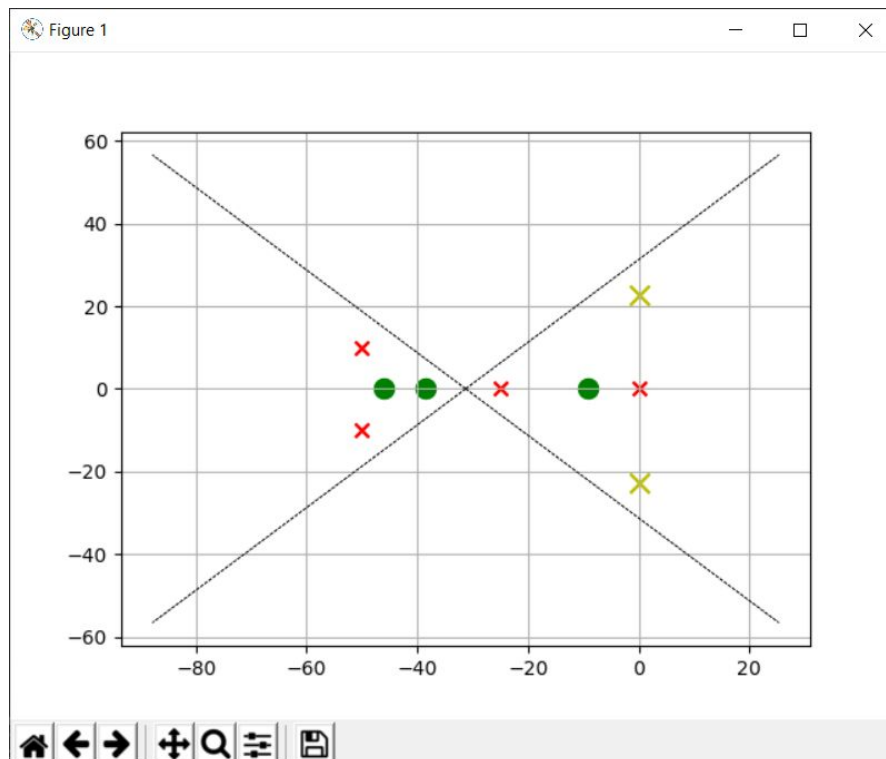
2. Get $\sigma = n - m$ (n : number of root locus branches and m : number of branches) and draw the asymptotes (dotted lines).



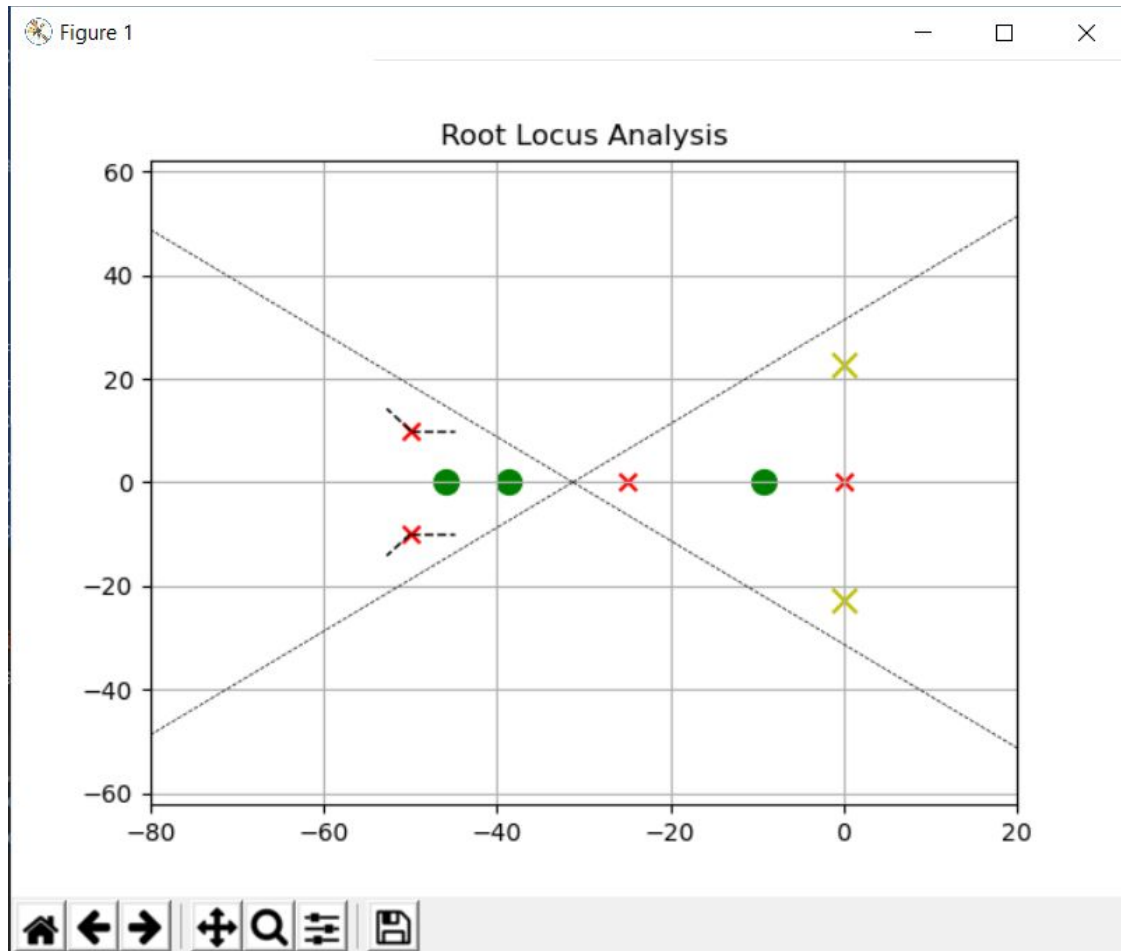
3. Find break away and break in points between any two real poles which they are the roots of the derivative of the characteristic equation.



4. Find imaginary axis crossings by using Routh method.



5. Find departure angles for complex poles: $\text{departure (angle)} + \text{sum}(\text{poles_angles}) = 180$, using the distances between poles and triangles geometry, angles can be computed, then draw the found angles on the plot.



6. Following the asymptotes, draw approximated curves that start at a complex pole or the break away point and end at the intersection with the imaginary axis or keeps going to infinity.

