SEOUL NATIONAL UNIVERSITY
SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING

SYSTEM CONTROL **Fall 2014**

Quiz #5
Due: November 11(Tu)

Student ID#_____ Name:_____

[1] A Nyquist plot of a unity-feedback system with the feedforward transfer function G(s) is shown in Figure 7-159.

If G(s) has one pole in the right-half s plane, is the system stable?

If G(s) has no pole in the right-half s plane, but has one zero in the right-half s plane, is the system stable?

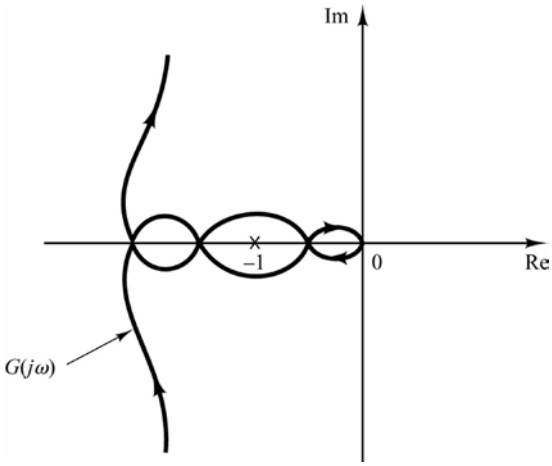


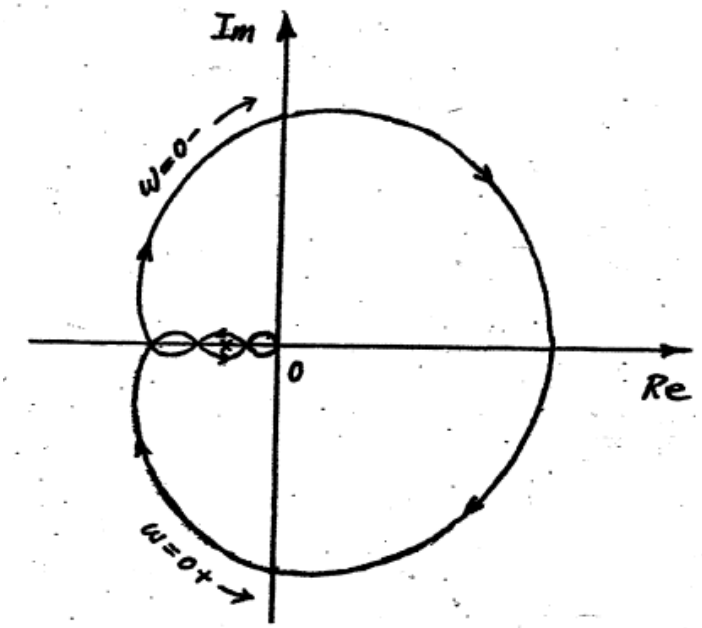
Figure 7-159 Nyquist Plot

soultion

Consider the case where G(s) has one pole in the right-half s plane. From the Nyquist plot of G(jw) shown below, the -1+j0 point is encircled by the G(jw) locus once clockwise and once counterclockwise. Hence, N=0. Since G(s) has one pole in the right-half s plane, we have P=1. Since

$$Z = N + P = = 0 + 1 = 1$$

The system is unstable.



Next, consider the case where G(s) has no pole in the right-half s plane, but has one zero in the right-half s plane. The -1 +j0 point is encircled by the G(jw) locus once clockwise and once counterclockwise. Hence, N = 0. Since G(s) has no poles in the right-half s plane, we have P=0. Therefore,

$$Z = N + P = = 0 + 0 = 0$$

The system is stable. (Note that the presence of a zero of G(s) in the right-half s plane does not affect the stability of the system.