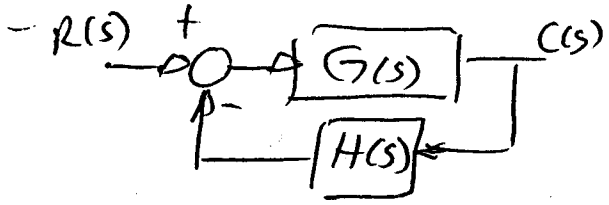
EEL 3657 HARALAMBOUS NYQUIST DIAGRAM SUMMARY.

OBJECTIVE: USE THE NYQUIST DIAGRAM TO DETERMINE CLOSED-LOOP SYSTEM STABILITY.

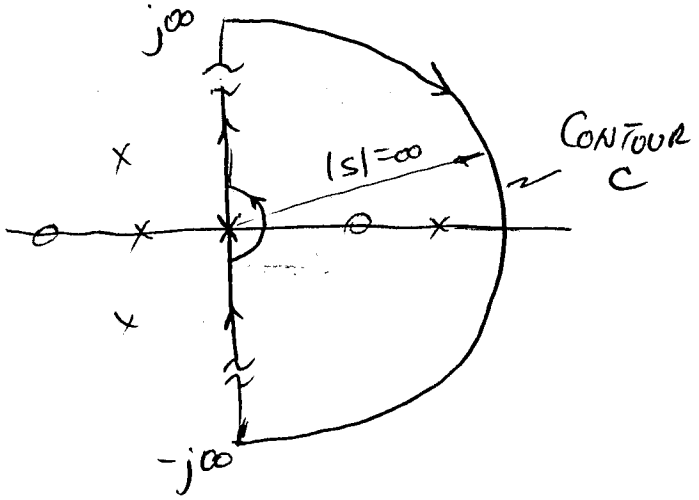


$$\frac{C(s)}{R(s)} = \frac{G(s)}{1+G(s)H(s)}$$

LET $F(s) \triangleq 1+G(s)H(s)$

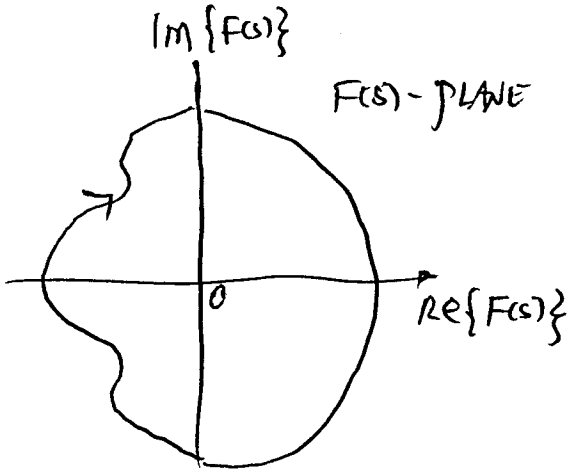
$$= H\,\frac{P_1(\ )}{Q(s)}$$

$$F(s) = \frac{P_1(s)+Q(s)}{Q(s)}$$

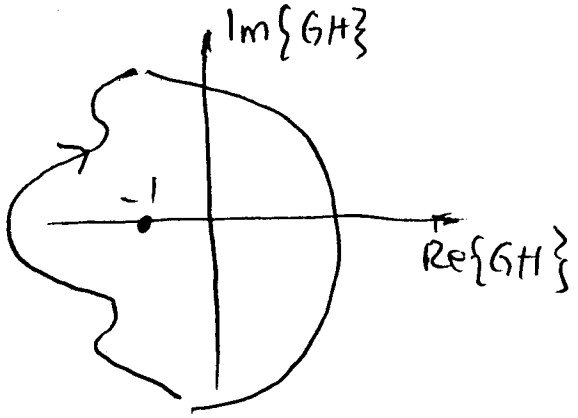


Z = # ZEROS OF $1+G(s)H(s)$ IN RHP
($=0$ FOR STABILITY)

P = # POLES OF $1+G(s)H(s)$ IN RHP
= # POLES OF $G(s)H(s)$ IN RHP.



$$G(s)H(s) = [1+G(s)H(s)] - 1$$



N = # CW ENCIRCLEMENTS OF ORIGIN OF $1+GH$ PLANE

$N \equiv$ # CW ENCIRCLEMENTS OF THE -1 POINT OF GH-PLANE

$$Z = N+P \geq 0$$

$Z=0 \Rightarrow$ STABLE CL. LOOP SYS.

$Z>0 \Rightarrow$ UNSTABLE CL. " "