Assignment of Systems Control I No.11 6th, Jan. 2020 (12)

Name ______________________

[1] $G_\ell = \dfrac{s+1}{s-2}$

$\Rightarrow$ using Nyquist stability criteria discuss the stability for the closed loop system

$P = 1$ ← unstable root is one

$$G_\ell(j\omega) = \frac{j\omega+1}{j\omega-2} = \frac{(1+\omega j)(-2-\omega j)}{(-2+\omega j)(-2-\omega j)} = \frac{-2+\omega^2-3\omega j}{4+\omega^2}$$

$$= \frac{\omega^2-2}{\omega^2+4} + \frac{-3\omega}{\omega^2+4} j$$

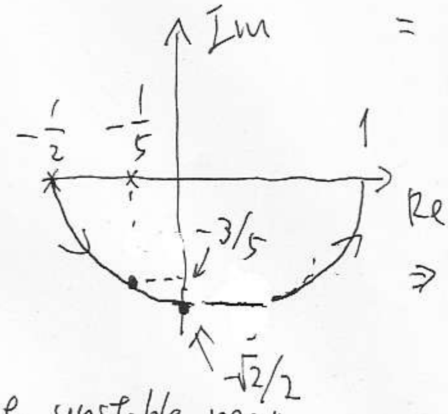
$$\qquad X \qquad\qquad Y$$

$$= \frac{1-2/\omega^2}{1+4/\omega^2} + \frac{-3}{\omega+4/\omega}$$

ω	X	Y
0	$-\frac{1}{2}$	-0
1	$-\frac{1}{5}$	$-\frac{3}{5}$
$\sqrt{2}$	0	$-\sqrt{2}/2$
∞	$+1$	-0

faster ?

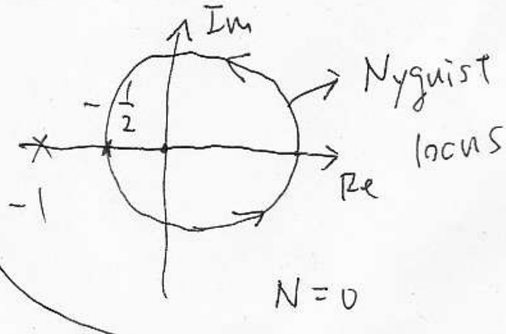
→ faster



⇒ vector locus

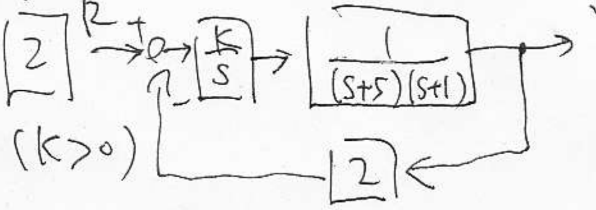
$Z = N + P$

$= 0 + 1 \Rightarrow$ one unstable root



$N = 0$

[2]



$(K>0)$

$$G_{cl} = \frac{\frac{K}{s(s+5)(s+1)}}{1+\frac{2K}{s(s+5)(s+1)}} = \frac{K}{s^3+6s^2+5s+2K}$$

$$G_{cl}(j\omega) = \frac{K}{-\omega^3 j - 6\omega^2 + 5\omega j + 2K}$$

$$G_{cl}(j\omega) = -1 \Rightarrow K = \omega^3 j + 6\omega^2 - 5\omega j - 2K$$

$$\Rightarrow (6\omega^2 - 3K) + (\omega^3 - 5\omega) j = 0$$

$$\to \omega(\omega^2-5) = 0 \to \omega^2 = 5$$

$$6 \times 5 - 3K = 0$$

$$3K = 30 \to K = 10 \to 0 < K \leq 10$$