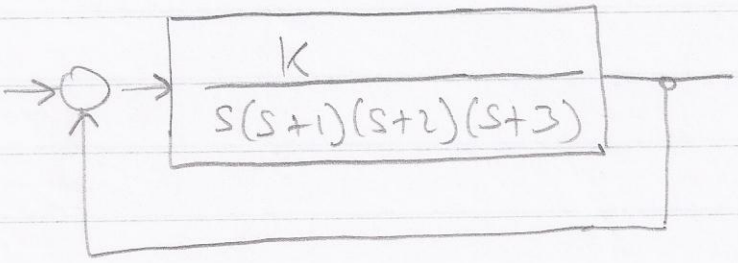
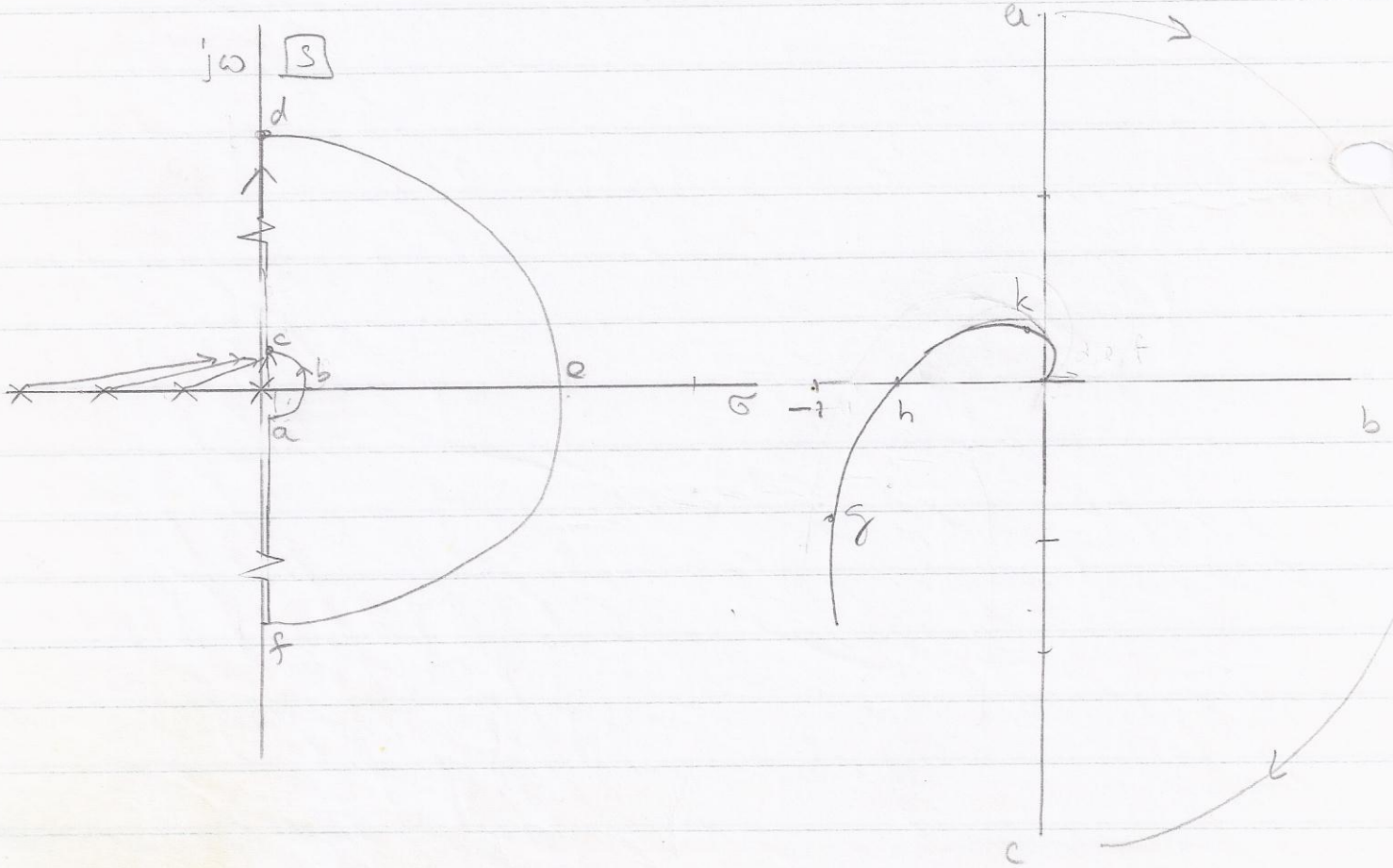
This exercise was not given in class 18/11 (1)

Relative Stability

1. If the system is stable, how stable is it?
2. If the system is not stable or not stable enough, how can the stability be improved?

∴ N=1-3





$$s = \rho e^{j\phi}$$

$$GH = \frac{K}{\rho e^{j\phi}(\rho e^{j\phi}+1)(\rho e^{j\phi}+2)(\rho e^{j\phi}+3)}$$

$$\lim_{\rho \to 0} GH = \infty \; e^{-j\phi}$$

$$s = \frac{1}{\rho} e^{j\phi}$$

$$GH = \frac{K}{\frac{1}{\rho} e^{j\phi}\left(\frac{1}{\rho}e^{j\phi}+1\right)\left(\frac{1}{\rho}e^{j\phi}+2\right)\left(\frac{1}{\rho}e^{j\phi}+3\right)}$$

$$\lim_{\rho \to 0} GH = 0 \; e^{-4j\phi}$$

	a	b	c	d	e	f
S	$0\angle -90^\circ$	$0\angle 0^\circ$	$0\angle +90^\circ$	$\infty\angle -90^\circ$	$\infty\angle 0^\circ$	$\infty\angle -90^\circ$
W	$\infty\angle +90^\circ$	$\infty\angle 0^\circ$	$\infty\angle -90^\circ$	$0\angle -360^\circ$	$0\angle 0$	$0\angle +360^\circ$

$$GH = \frac{K}{s(s+1)(s+2)(s+3)}$$

$$(s+1)(s+2) = (s^2+3s+2)$$

$$(s^2+3s+2)(s+3) = s^3+3s^2+2s$$
$$\underline{3s^2+9s+6}$$
$$s^3+6s^2+11s+6$$

$$s(s^3+6s^2+11s+6) = s^4+6s^3+11s^2+6s$$

$$GH = \frac{K}{s^4+6s^3+11s^2+6s}$$

$s = \frac{1}{2}j \rightarrow$

$$GH = \frac{K}{(\frac{1}{2}j)^4+6(\frac{1}{2}j)^3+11(\frac{1}{2}j)^2+6(\frac{1}{2}j)} = \frac{K}{\frac{1}{16}-\frac{6}{8}j-\frac{11}{4}+3j}$$

$$= \frac{K}{-\frac{43}{16}+\frac{36}{16}j} = \frac{K}{-2.68+2.25j} = \frac{K(-2.68-2.25j)}{(2.68)^2+(2.25)^2}$$

$$GH = K(-0.22-0.18j)$$

$s = j$

$$GH = \frac{k}{j^4 + 6j^3 + 11j^2 + 6j} = \frac{k}{1 - 6j - 11 + 6j} = \frac{k}{-10}$$

$s = 2j$

$$GH = \frac{k}{(2j)^4 + 6(2j)^3 + 11(2j)^2 + 6(2j)} = \frac{k}{16 - 48j - 44 + 12j}$$

$$GH = \frac{k}{-28 - 36j} = \frac{k(-28 + 36j)}{(28^2 + 36^2)} = k(-0.013 + 0.017j)$$

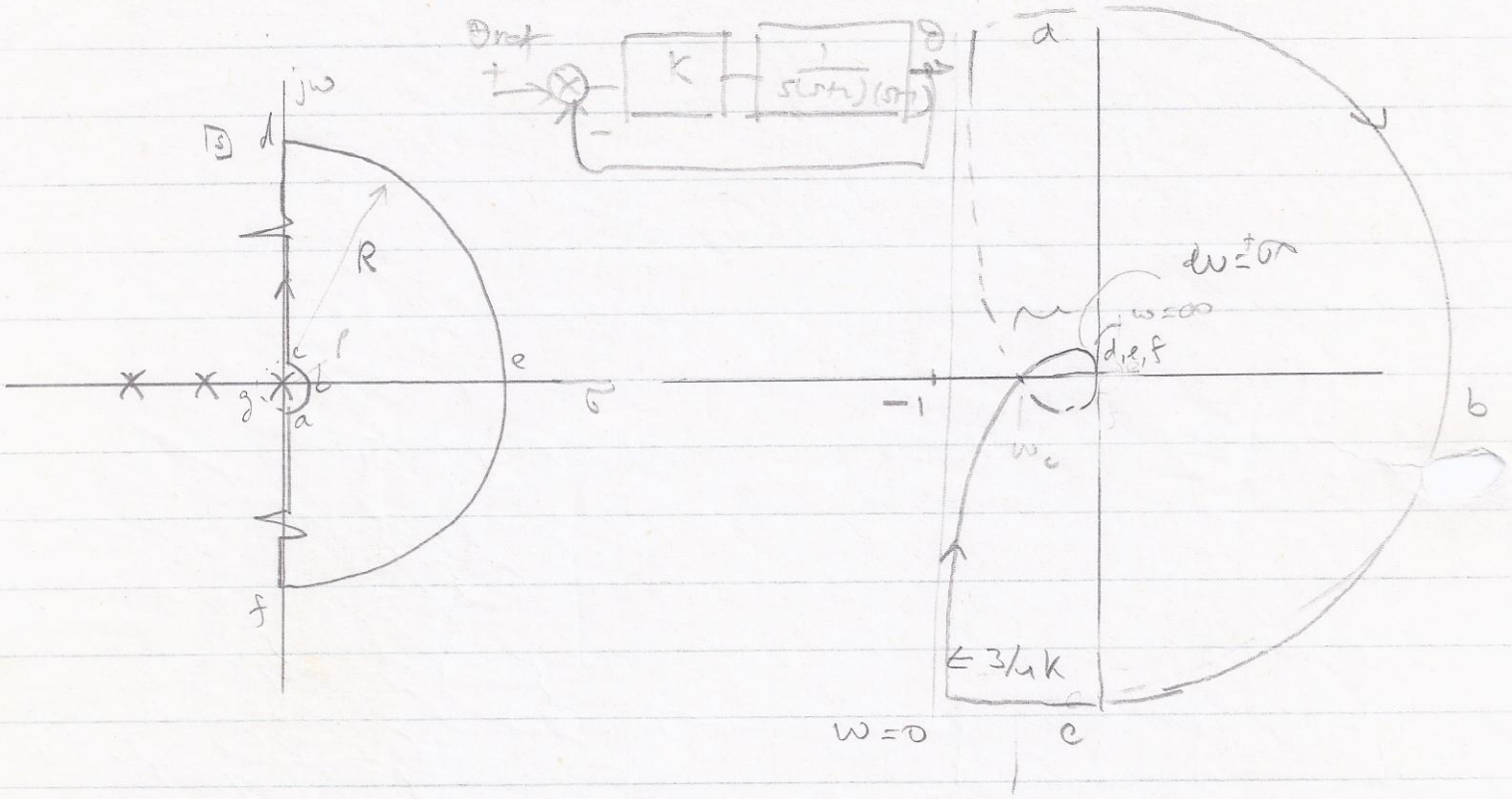
$k = 5$ לקור

	g	h	k
s	0.5j	j	2j
GH	-1.1 - 0.9j	-0.5	-0.06 + 0.08j

19/11/1979

Relative Stability
1). if stable, how stable is it
2) if not stable or not stable enough
how can it be improved

$$GH(s) = \frac{K}{s(s+2)(s+1)}$$



$s = \rho e^{j\phi}$

a,b,c : לפי סדר

$$GH = \frac{K}{\rho e^{j\phi}(\rho e^{j\phi}+1)(\rho e^{j\phi}+2)}$$

$$\lim_{\rho \to 0} GH = \infty \, e^{-j\phi}$$

$$GH = \frac{K}{R e^{j\phi}(R e^{j\phi}+1)(R e^{j\phi}+2)}$$

d,e,f : לפי סדר

$$\lim_{\rho \to 0} GH = 0 \, e^{-3j\phi}$$