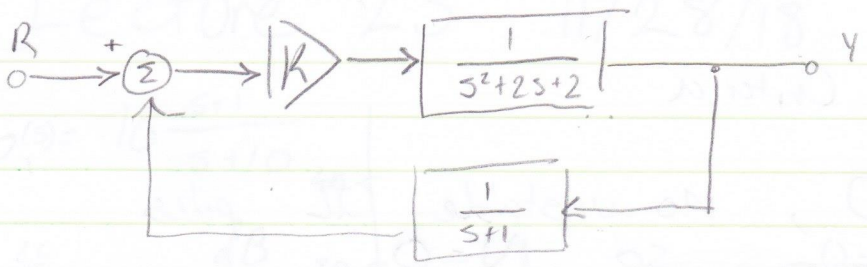
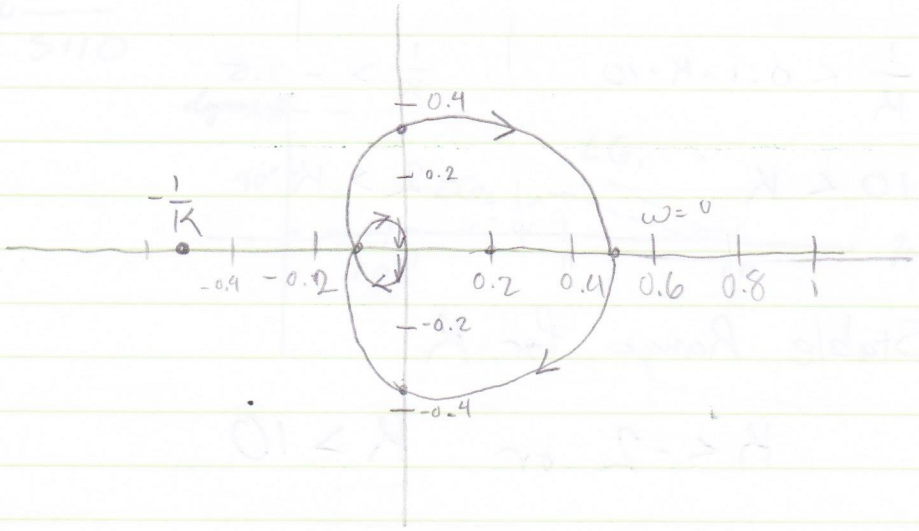
6.21)



$$\cdot K\,G(s) = K \cdot \frac{1}{(s+1)(s^2+2s+2)}$$



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

$$G(j0) = \frac{1}{1\cdot 2} = \frac{1}{2}$$

Real intercepts: $-\omega^3+4\omega = 0$, $\omega = 0, \pm 2$

$$G(j\pm 2) = \frac{1}{-3(\pm 2)^2+2} = -\frac{1}{10}$$

imaginary intercepts: $-3\omega^2+2=0$, $\omega = \pm\sqrt{\frac{2}{3}}$

$$G\left(\omega = \pm\frac{\sqrt{2}}{\sqrt{3}}\right) = \frac{1}{j\left(-\left(\pm\frac{\sqrt{2}}{\sqrt{3}}\right)^3+4\left(\pm\frac{\sqrt{2}}{\sqrt{3}}\right)\right)} = \frac{-j}{-(\pm 0.544)\pm 3.27} = \mp 0.367\,j$$

$$\lim_{r\to\infty} G(re^{j\theta}) = \lim_{r\to\infty} \frac{1}{(re^{j\theta}+1)(-r^2e^{2j\theta}+2re^{j\theta}+2)} = \lim_{r\to\infty} \frac{1}{re^{j\theta}(-r^2e^{2j\theta}+2re^{j\theta})}$$

$$= \lim_{r\to\infty} \frac{1}{-r^3e^{3j\theta}+2r^2e^{2j\theta}} = 0\cdot e^{-3j\theta}$$

$\theta = \frac{\pi}{2} \rightarrow 0\cdot e^{-j\frac{3\pi}{2}}$

$\theta = -\frac{\pi}{2} \rightarrow 0\cdot e^{j\frac{3\pi}{2}}$

6.21 cntd Stability Criteria

$P = 0$, no unstable O.L poles

want $Z = 0$, so $N = 0$

$$-\frac{1}{K} < -0.1 \quad \text{or} \quad -\frac{1}{K} > 0.5$$

$$10 \cdot K \cdot \frac{1}{K} < 0.1 \cdot K \cdot 10 \qquad \frac{1}{K} > -0.5$$

$$10 < K \qquad -2 > K$$

Stable Range for K

$$K < -2 \text{ or } K > 10$$