

1. Consider the negative unity gain feedback system where $Y(s)$ is the output and $X(s)$ is the input and

$$GH = \frac{K[s^2/10]}{s^2(s+3.6)}$$

- (a) Find Y/X
 (b) Determine the real-line root locus of the open-loop gain GH
 (c) Determine the intercepts and asymptotes
 (d) Evaluate the characteristic equation of the closed-loop system
 (e) Evaluate the break-away points
 (f) Draw the completed root-locus diagram

2. Consider the unity neg. feedback system $GH = \frac{K(s+4)}{s(s+2)(s+1)}$

- (a) Determine real root locus
 (b) Determine intercepts and asymptotes
 (c) characteristic eqn
 (d) Breakin/away pts
 (e) $j\omega$ -axis crossing
 (f) Draw completed root-locus

3. Consider the ^{causal} system with a closed-loop transfer function

$$H(s) = \frac{4}{s^2 + 2s + 4} = \frac{Y}{X} = \frac{U}{V}$$

- (a) Given $x(t) = u(t)$ find $y(t)$

(b) If

$$\dot{\underline{x}} = [A] \underline{x} + [B] u$$

$$\underline{y} = [C] \underline{x}$$

$$\frac{Y}{U} = \frac{4}{s^2 + 2s + 4}$$

find A, B, C .