

E 2.4a $y(t) = 1 + 0.6e^{-20t} - 1.6e^{-10t}$

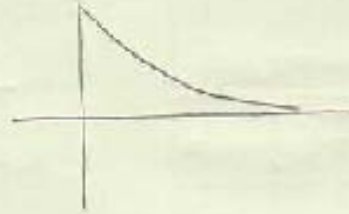
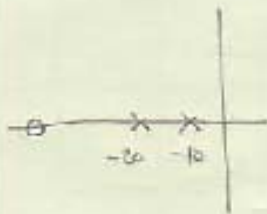
E 2.4b 1

E 2.12 $K_1 K_2 = 1$

Nat Resp HW Soln

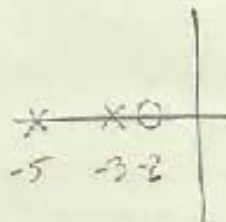
1a) $\omega_n = 10\sqrt{2}$ $\zeta = 3/2\sqrt{2}$ Overdamped

DC = 1 FV = $\infty, 1$



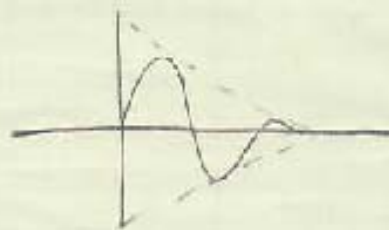
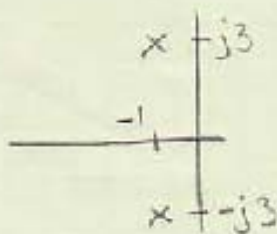
b) $\omega_n = \sqrt{15}$ $\zeta = 4/\sqrt{15}$ Overdamped

DC = $4/3$ FV = $\infty, 4/3$



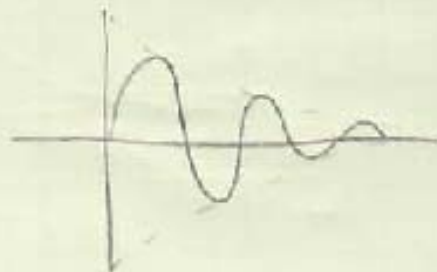
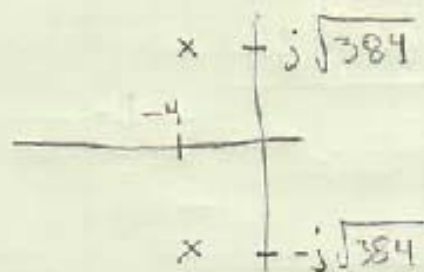
c) $\omega_n = \sqrt{10}$ $\zeta = 1/\sqrt{2}$ Underdamped

DC = 1 FV = $\infty, 1$



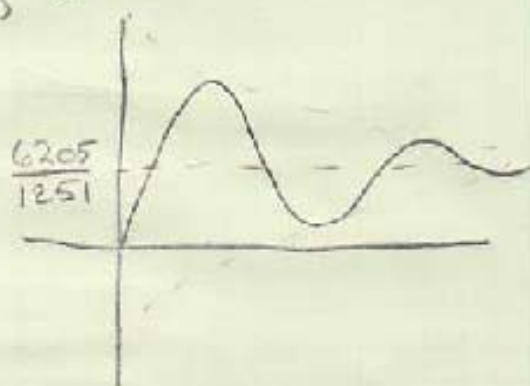
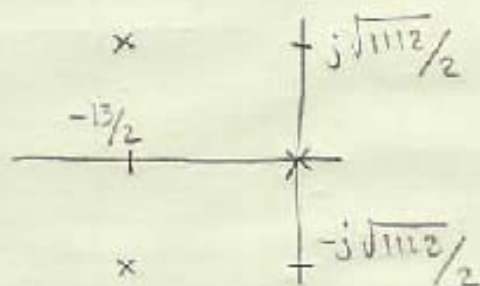
d) $\omega_n = 20$ $\zeta = .2$ Underdamped

DC = 1 FV = 1.1



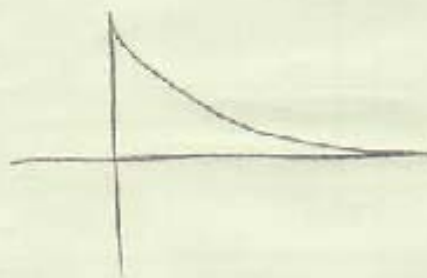
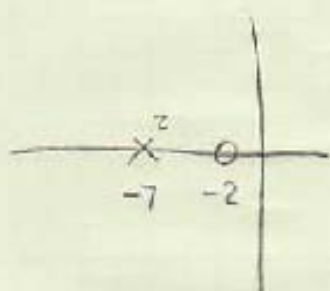
e) $\omega_n = \sqrt{1281}$ $\zeta = \frac{3}{2\sqrt{1281}}$ Underdamped

DC = ∞ FV = $\frac{6205}{1281} > \infty$



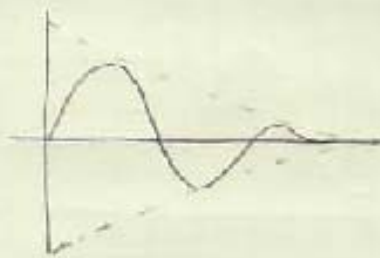
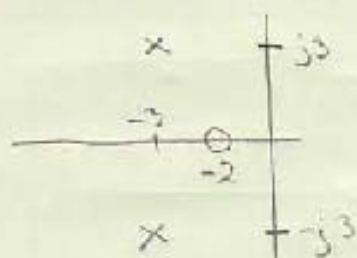
f) $\omega_n = 7$ $\zeta = 1$ Critically Damped

$$DC = \frac{2}{49} \quad FV = \infty, \frac{2}{49}$$

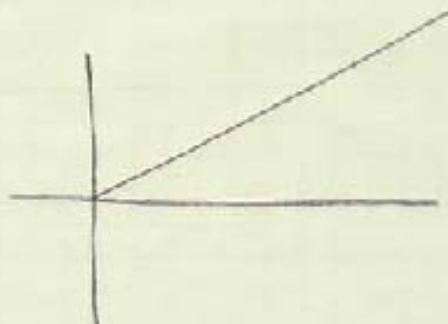
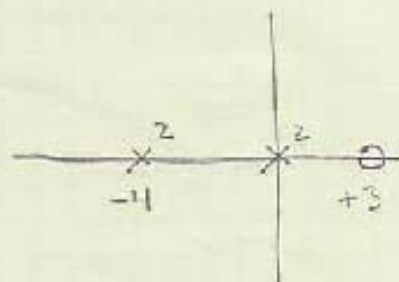


g) $\omega_n = 3\sqrt{2}$ $\zeta = \frac{1}{\sqrt{2}}$ Underdamped

$$DC = \frac{1}{18} \quad FV = \infty, \frac{1}{18}$$

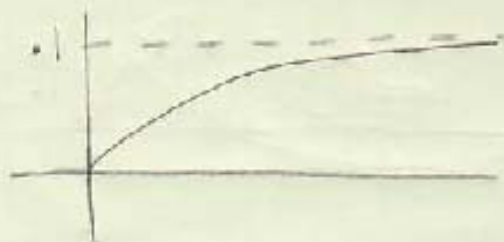
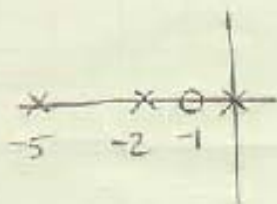


h) Unstable $DC = FV = \infty$

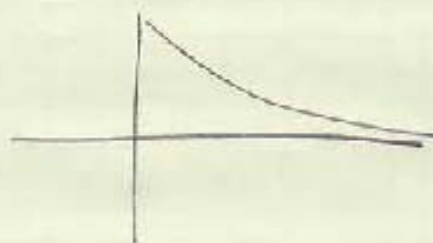
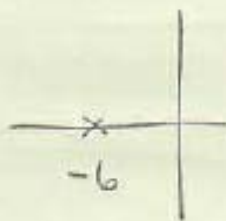


i) $\omega_n = \sqrt{10}$ $\zeta = 7/2\sqrt{10}$ Overdamped

DC = ∞ FV = .1, ∞



j) DC = $2/3$ FV = 0, $2/3$ First order



k) $\omega_n = 8$ $\zeta = 0$ Undamped

DC = ∞ FV = $1/32$, ∞

