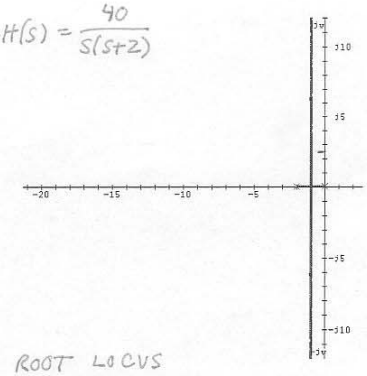
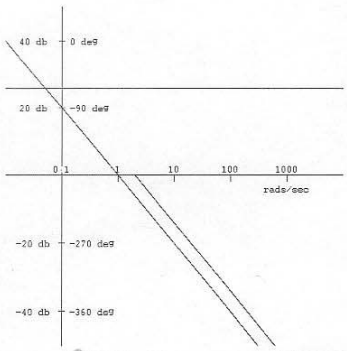
EE302 - COMPENSATION EXAMPLE

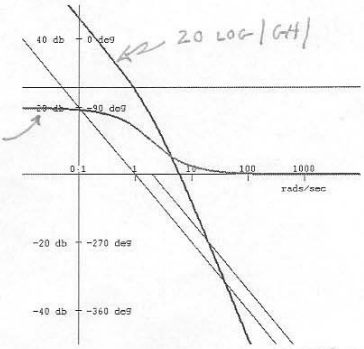
$$KGH(s) = \frac{40}{s(s+2)}$$



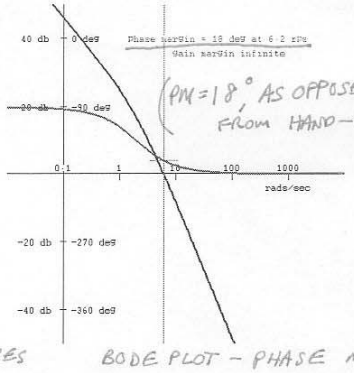
ROOT LOCUS



BODE PLOT - CONSTRUCTION

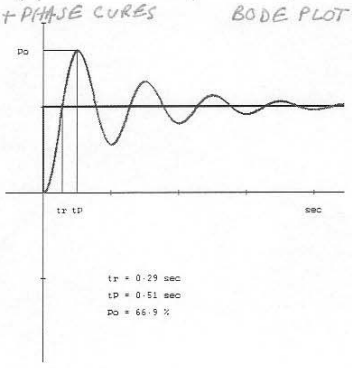


BODE PLOT - MAG + PHASE CURES



(PM = 18°, AS OPPOSED TO 22° FROM HAND-DRAWN PLOTS)

BODE PLOT - PHASE MARGIN



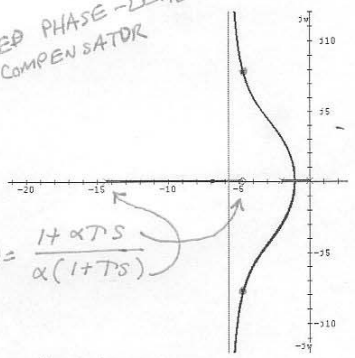
tr = 0.29 sec
tp = 0.51 sec
Po = 66.9 %

STEP RESPONSE

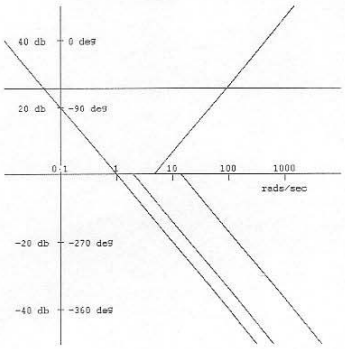
GIVEN ROOT LOCUS, THE POLES OF T(S) ~~CAN NEVER~~ ALWAYS HAVE A NEGATIVE REAL PART ($-\zeta\omega_n$) NEAR $j\omega$ AXIS. HENCE STEP RESPONSE IS QUITE OSCILATORY.

EE 302 – COMPENSATION EXAMPLE

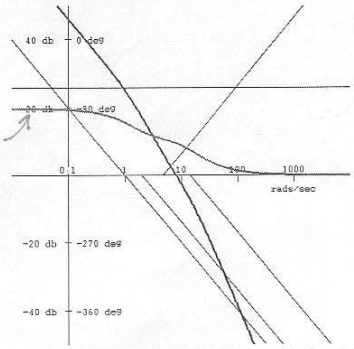
ADDED PHASE-LEAD COMPENSATOR



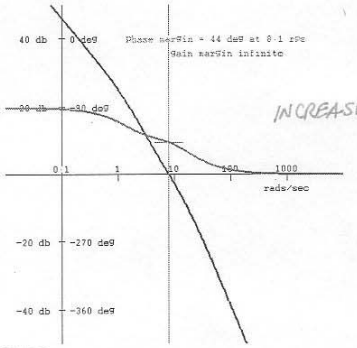
$$G_c(s) = \frac{1+\alpha T s}{\alpha(1+Ts)}$$



ROOT LOCUS

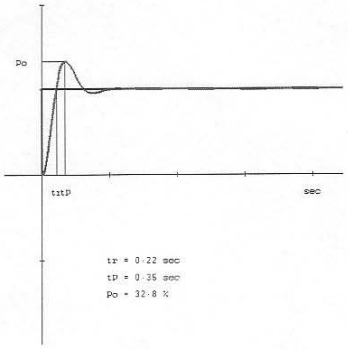


$\angle KGH$



INCREASED PHASE MARGIN

COMPENSATED VERSION OF BODE PLOT



INCREASED PM
⇕
INCREASED ζ
⇕
LESS OVERSHOOT