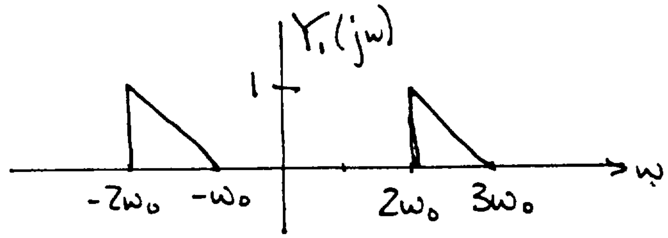
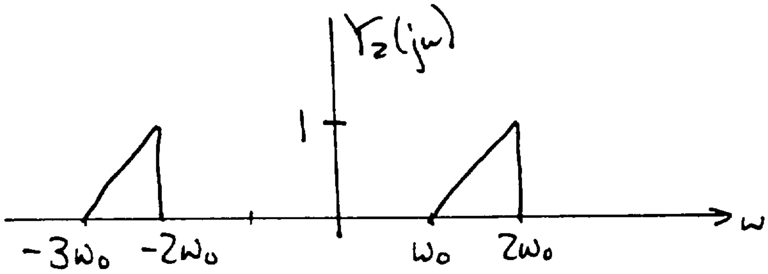
Georgia Institute of Technology
School of ECE
EE 3230
Solutions to Quiz # 2

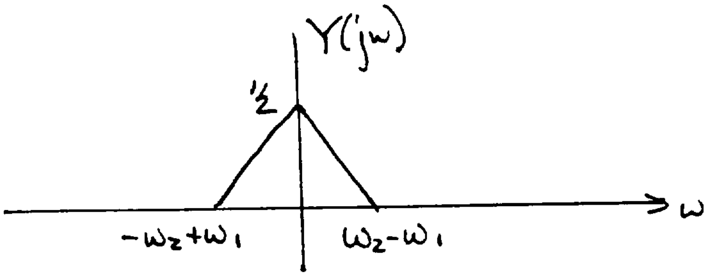
① (a)



(b)



② (a)



(b) Need $\frac{2\pi}{T} > 2(\omega_2-\omega_1)$

$$\Rightarrow T < \frac{\pi}{\omega_2-\omega_1}$$

③ $Y(s) = \frac{1}{s+2}$, $Re\{s\} > -2$

$X(s) = \frac{Y(s)}{H(s)}$ and ROC needs to have a non-zero intersection with $Re\{s\} > -2$.

Case 1: $Re\{s\} > 1$

$$X(s) = \frac{1}{s+2} \cdot \frac{s+1}{s-1} = \frac{1/3}{s+2} + \frac{2/3}{s-1}, \quad Re\{s\} > 1$$

$$x(t) = \tfrac{1}{3} e^{-2t} u(t) + \tfrac{2}{3} e^{t} u(t)$$

<u>Case 2:</u> $-2 < Re\{s\} < 1$

$$x(t) = \tfrac{1}{3} e^{-2t} u(t) - \tfrac{2}{3} e^{t} u(-t)$$

(4) $H(s) = \dfrac{G(s)}{1-gG(s)} = \dfrac{1}{(s-1)(s+3)-g}$

(a) $g=0 \Rightarrow \dfrac{1}{(s-1)(s+3)} \Rightarrow$ poles at 1 & -3.

$\Rightarrow$ not stable if system is causal.

Is stable if ROC is $-3 < Re\{s\} < 1$.

(b) $H(s) = \dfrac{1}{s^2+2s-3-g}$

Find g so that all poles in left half plane.

poles: $\dfrac{-2 \pm \sqrt{4+4(3+g)}}{2} = -1 \pm \sqrt{4+g}$

$\Rightarrow$ Need $\sqrt{4+g} < 1$

$4+g < 1$

$\Rightarrow \quad g < -3$