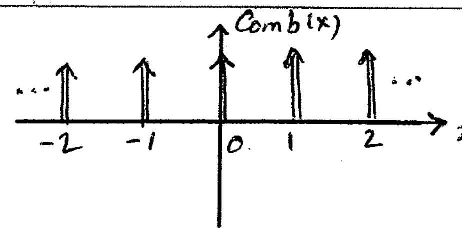
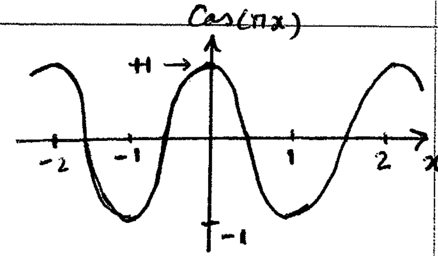
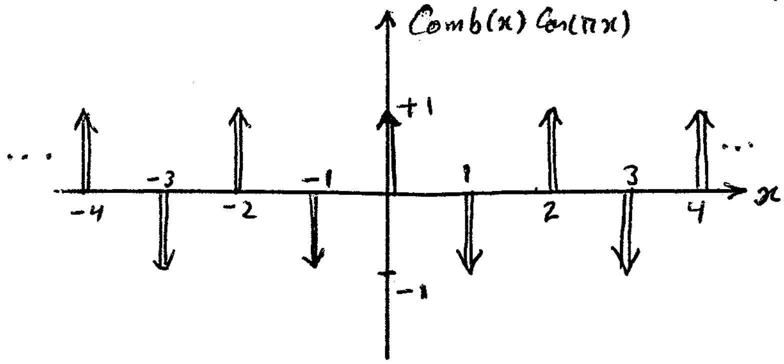
Problem 2) a)



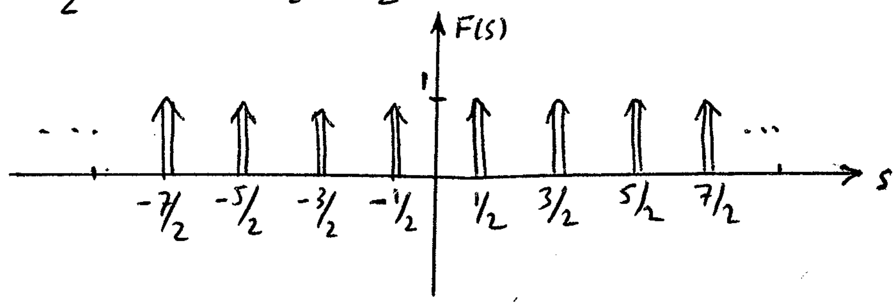




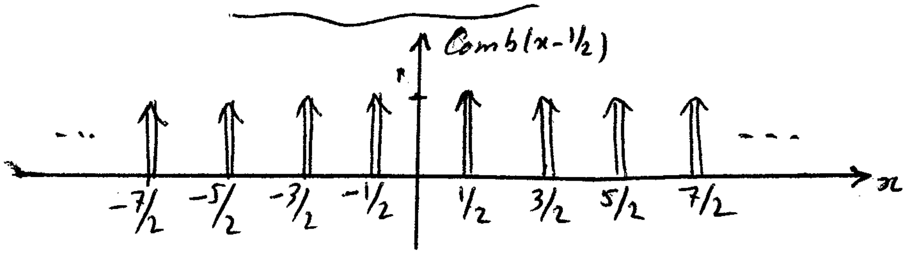
$$\mathcal{F}\{f(x)\} = \mathcal{F}\{\mathrm{Comb}(x)\cos(\pi x)\} = \mathcal{F}\{\mathrm{Comb}(x)\} * \mathcal{F}\{\cos(\pi x)\}$$

$$= \mathrm{Comb}(s) * \mathcal{F}\left\{\frac{e^{i\pi x}+e^{-i\pi x}}{2}\right\} = \frac{1}{2}\mathrm{Comb}(s) * \left\{\delta(s-\tfrac{1}{2}) + \delta(s+\tfrac{1}{2})\right\}$$

$$\Longrightarrow \quad F(s) = \frac{1}{2}\mathrm{Comb}(s-1/2) + \frac{1}{2}\mathrm{Comb}(s+1/2)$$



b)



$$G(s) = \mathcal{F}\{\mathrm{Comb}(x-1/2)\} = \int_{-\infty}^{\infty} \mathrm{Comb}(x-1/2)\, e^{-i2\pi s x}\, dx$$

Change of variable $y = x - 1/2 \Rightarrow G(s) = \int_{-\infty}^{\infty} \mathrm{Comb}(y)\, e^{-i2\pi s(y+1/2)}\, dy$

$$= e^{-i\pi s}\int_{-\infty}^{\infty} \mathrm{Comb}(y)\, e^{-i2\pi s y}\, dy = e^{-i\pi s}\,\mathrm{Comb}(s) = \cos(\pi s)\,\mathrm{Comb}(s) + i\sin(\pi s)\,\mathrm{Comb}(s)$$

Since $\sin(\pi s)$ is equal to zero at $s = 0, \pm 1, \pm 2, \dots$, we'll have $G(s) = \cos(\pi s)\,\mathrm{Comb}(s)$. The plot is similar to that shown in part (a).