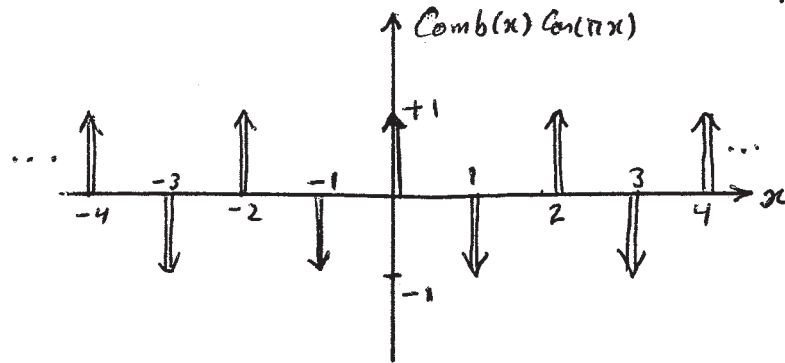
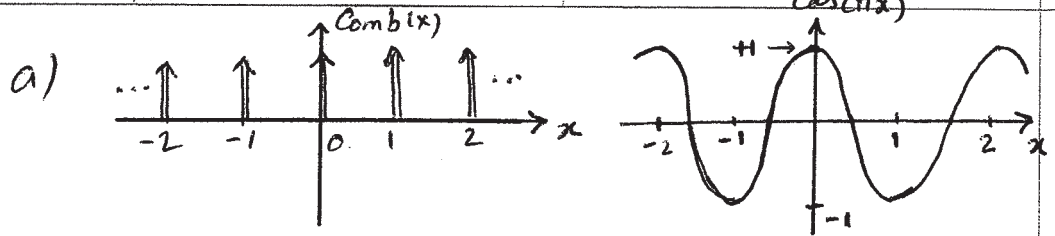
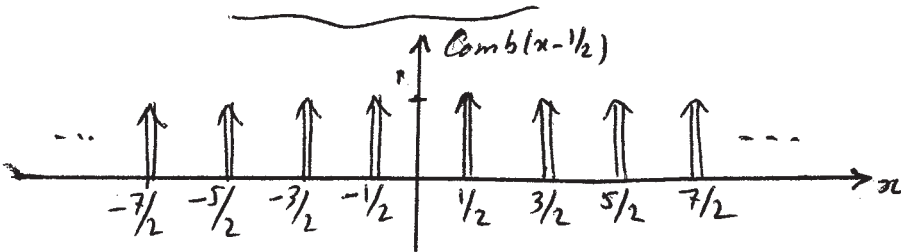
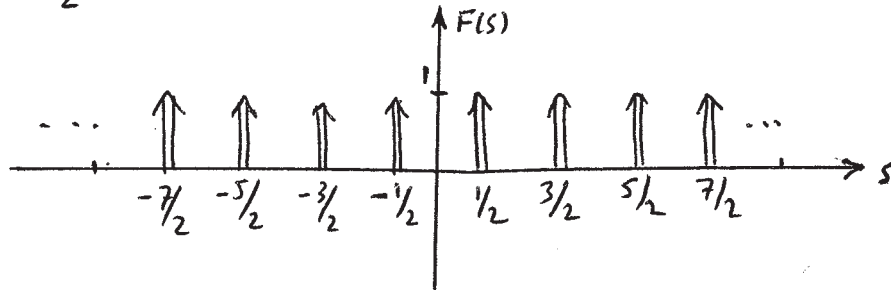


Problem 30)



$$\begin{aligned} \mathcal{F}\{f(x)\} &= \mathcal{F}\{\text{Comb}(x) \cos(\pi x)\} = \mathcal{F}\{\text{Comb}(x)\} * \mathcal{F}\{\cos(\pi x)\} \\ &= \text{Comb}(s) * \mathcal{F}\left\{\frac{e^{i\pi x} + e^{-i\pi x}}{2}\right\} = \frac{1}{2} \text{Comb}(s) * \left\{\delta\left(s-\frac{1}{2}\right) + \delta\left(s+\frac{1}{2}\right)\right\} \end{aligned}$$

$$\Rightarrow F(s) = \frac{1}{2} \text{Comb}\left(s-\frac{1}{2}\right) + \frac{1}{2} \text{Comb}\left(s+\frac{1}{2}\right)$$



b)

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

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

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

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