FT {
$$xh(x)$$
 } = $\frac{1}{2\pi} H(f) = -\frac{1}{2}x^{2} f e^{-2x^{2} f^{2}}$

FT { $g(x)$ } = $\frac{1}{2\pi} \frac{1}{\pi} (-\pi - 3 + 4\pi f^{2}) e^{-2\pi f^{2}}$

(b) $g(x) = \sin(\frac{\pi}{6}x) \Pi(\frac{x-3}{6}) = \frac{1}{2\pi} [e^{\frac{1}{2}e^{x}} - e^{\frac{1}{2}e^{x}}] \Pi(\frac{x-3}{6})$

FT { $\Pi(\frac{x-3}{6})$ } = $6e^{-\frac{1}{2}6\pi f} \sin c(6f)$

FT { $e^{-\frac{1}{2}e^{x}} \Pi(\frac{x-3}{6})$ } = $6e^{-\frac{1}{2}6\pi (f-\frac{1}{6})} \sin c(6(f-\frac{1}{6}))$

FT { $g(x)$ } = $\frac{3}{2\pi} [e^{-\frac{1}{2}6\pi (f-\frac{1}{6})} \sin c(6(f-\frac{1}{6})) - \frac{1}{2}6\pi (f+\frac{1}{6})$
 $e^{-\frac{1}{2}6\pi (f+\frac{1}{6})} \sin c(6(f+\frac{1}{6}))$

 $\int \cdot (a) g(x) = e^{-\pi \frac{x^2}{2}} (x^3 + x)$ $f(x) = e^{-\pi f(x)^2} \cdot f(x) = e^{-2\pi f(x)^2} = f(x)$

(c)
$$g(x) = \bigwedge (x+1) - \bigwedge (x-1)$$

 $f(x) = \sin x$
 $f(x) = \sin x$

g(x) is impulse train, intervel is Th

 $FT(g(x)) = \frac{1}{\pi} \sum_{n=-\infty}^{\infty} S(f-\frac{n}{\pi})$

 $\int_{1}^{\infty} \frac{1}{5(t)} = \sum_{n=\infty}^{\infty} \frac{1}{5(t-n\tau)}, FT\{s(t)\} = \int_{1}^{\infty} \frac{1}{5} \frac{1}{5(t-\tau)}$

2. If
$$g(r) = \operatorname{Cir}((r))$$

$$G(s) = \frac{J_1(J\pi s)}{s} = \frac{J_1(J\pi \sqrt{f^2 + h^2})}{\sqrt{f^2 + h^2}}$$
If $\chi \neq h$ shift 1, $\chi \neq h$ scale 2
$$\int e^{-j\pi f} \frac{J_1(J\pi \sqrt{f^2 + 4h^2})}{\sqrt{f^2 + 4h^2}}$$

3.
$$N-1 \qquad -j2\pi \frac{mn}{N}$$

$$X[m] = \sum_{N=0}^{\infty} X[n] Q \qquad , N=30$$

$$= \sum_{k=0}^{\infty} e^{-j2\pi} \frac{m(3k)}{30} + \sum_{k=0}^{\infty} e^{-j2\pi} \frac{m(15k)}{30} - \sum_{k=0}^{\infty} e^{-j2\pi} \frac{m(15k)}{30}$$

$$= \sum_{k=0}^{\infty} e^{-j2\pi} \frac{m(15k)}{30} + \sum_{k=0}^{\infty} e^{-j2$$

$$= \sum_{k=0}^{9} e^{-j2\pi} \frac{m(3k)}{30} + \sum_{k=0}^{5} e^{-j2\pi} \frac{m(5k)}{30} - \sum_{k=0}^{1} e^{-j2\pi} \frac{m(5k)}{30}$$

 $= [0p_{s}[m] + 6p_{s}[m] - 2p_{s}[m], o \le m < 30$

$$\begin{array}{ll}
(\alpha) & \text{SiN}(5\pi x) \cos(3\pi x) & \text{Sinc}(5x) & \text{Sinc}(10x) \\
g_1(x) & = \text{Sin}(5\pi x) \cos(3\pi x) & = \frac{1}{2} \left[\text{Sin}(8\pi x) + \text{Sin}(2\pi x) \right] \\
g_2(x) & = \text{Sinc}(5x) & g_3(x) & = \text{Sinc}(10x)
\end{array}$$

$$g_{1}(x) = \sin(5\pi x)\cos(5\pi x) = \frac{1}{2}[\sin(8\pi x) + \sin(2\pi x)]$$

$$g_{2}(x) = \sin(5x), g_{3}(x) = \sin(6x)$$

$$G_{1}(f) = F7[g_{1}(x)] = \frac{1}{4}[\delta(f-4) - \delta(f+4)]$$

$$G_{2}(f) = F7[g_{1}(x)] = \frac{1}{4}[\delta(f-4) - \delta(f+4)]$$

$$G_{2}(x) = 5/(2(5x)), G_{3}(x) = -1/(6x)$$
 $G_{1}(f) = F7 \{g_{1}(x)\} = \frac{1}{47} \{\delta(f-4) - \delta(f+4) + \delta(f-4)\}$
 $G_{2}(f) = F7 \{g_{2}(x)\} = \{5, -\frac{5}{3} \le f \le \frac{5}{3}\}$

$$f = f(f(x)) = 4 (3(x)) + 8(1-1)$$

$$(f) = f(f(x)) = (5, -\frac{5}{3}) = (5, -\frac{5}{3}) = (6, -\frac{5}{3})$$

$$(f) = f(f(x)) = (6, -\frac{5}{3}) = (6, -\frac{5}{$$

$$(f) = [-7 \{ J_{3}(x) \}] = \{ \frac{1}{5}, -\frac{5}{3} \le f \le \frac{5}{3} - \delta(f+1) \}$$

$$(f) = [-7 \{ J_{3}(x) \}] = \{ \frac{1}{10}, -\frac{5}{5} \le f \le \frac{5}{3} \}$$

$$G_{1}(f) = FT \{g_{1}(x)\} = \frac{1}{4J} \left[\delta(f-4) - \delta(f+4) + \delta(f-1) \right]$$

$$G_{12}(f) = FT \{g_{2}(x)\} = \begin{cases} 5, -\frac{5}{2} \le f \le \frac{5}{2} \\ 0, \text{ elsewhere} \end{cases}$$

$$G_{3}(f) = FT \{g_{3}(x)\} = \begin{cases} \frac{1}{10}, -5 \le f \le 5 \\ 0, \text{ elsewhere} \end{cases}$$

$$G_{3}(f) = G_{1}(f) G_{2}(f) G_{3}(f) = \frac{1}{100} \cdot \frac{1}{2J} \left[\delta(f-1) - \delta(f+1) \right]$$

$$g(x) = FT^{-1} \left\{ G_{1}(f) \right\} = \frac{1}{100} \sin(2\pi x)$$

$$(b) \ \delta(x) + \delta(x) + \delta(x-3) + e^{-x^{2}}$$

$$= -2x e^{-x^{2}} + \frac{1}{2} \delta(x) + \delta(x-3)$$

$$= -2xe^{-x^{2}} + \frac{1}{2}S(x) + S(x-3)$$

$$= -xe^{-x^{2}} + \frac{1}{2}S(x) + \frac{1}{2}S(x-3)$$

 $= -(\chi - 3) e^{-(\chi - 3)^2}$

$$= -2 \times e^{-x^{2}} + \frac{1}{2} \delta(x) + \delta(x-3)$$

$$= - \times e^{-x^{2}} + \delta(x-3)$$