7. $F[e^{iw_0 x}] = \sqrt{2\pi}\cdot\delta(w-w_0)$

$$f(x) = a_0 + \sum_{n=1}^{\infty}\left(a_n\cos\frac{n\pi}{l}x + b_n\sin\frac{n\pi}{l}x\right)$$

$$= a_0 + \sum_{n=1}^{\infty}\left(\underbrace{\frac{a_n - ib_n}{2}}_{C_n}\cdot e^{i\frac{n\pi}{l}x} + \underbrace{\frac{a_n + ib_n}{2}}_{d_n} e^{i\frac{n\pi}{l}x}\right)$$

$$C_n = \frac{1}{2L}\left(\int_{-l}^{l} f(x)\cos\frac{n\pi}{l}x\,dx - i\int_{-l}^{l} f(x)\sin\frac{n\pi}{l}x\,dx\right) = \frac{1}{2L}\int_{-l}^{l} f(x)\cdot e^{-i\frac{n\pi}{l}x}\,dx$$

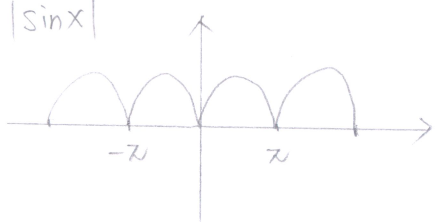
$$d_n = \frac{1}{2L}\left(\int_{-l}^{l} f(x)\cos\frac{n\pi}{l}x\,dx + i\int_{-l}^{l} f(x)\sin\frac{n\pi}{l}x\,dx\right) = \frac{1}{2L}\int_{-l}^{l} f(x)\,e^{i\frac{n\pi}{l}x}\,dx$$

$\therefore f(x) = a_0 + \sum_{n=-\infty}^{\infty} C_n e^{i\frac{n\pi}{l}x}$, $a_0 = \frac{1}{2L}\int_{-L}^{L} f(x)\,dx = C_0$

$\therefore f(x) = \sum_{n=-\infty}^{\infty} C_n e^{i\frac{n\pi}{l}x} = \sum_{n=-\infty}^{\infty} C_n e^{iw_n x}$

$\Rightarrow F\left[\sum_{n=-\infty}^{\infty} C_n e^{iw_n x}\right] = \sum_{n=-\infty}^{\infty} C_n\sqrt{2\pi}\,\delta(w-w_n)$, $C_n = \frac{1}{2L}\int_{-l}^{l} f(x)\,e^{-\frac{n\pi}{l}x}\,dx$

8. $|\sin x|$



$T = \pi$

$$f(x) = a_0 + \sum_{n=1}^{\infty}\left(a_n\cos\frac{2n\pi}{T}x + b_n\sin\frac{2n\pi}{T}x\right)$$

$$a_0 = \frac{1}{\pi}\int_0^{\pi}\sin x\,dx = \frac{1}{\pi}(-\cos x)\Big|_0^{\pi} = \frac{2}{\pi}$$

$$a_n = \frac{2}{\pi}\int_0^{\pi}|\sin x|\cos 2nx\,dx$$

$$= \frac{2}{\pi}\int_0^{\pi}\frac{\sin(1+2n)x + \sin(1-2n)x}{2}\,dx$$