$$f(x) = a_0 + \sum_{n=1}^{\infty} a_n \cos nx + b_n \sin x n$$

$$a_0 = \frac{1}{2L}\int_{-L}^{L} f(x)\,dx = \frac{1}{2\pi}\left(\pi^2 + \frac{1}{2}\pi^2\right) = \frac{3\pi}{4}$$

$$a_n = \frac{1}{L}\int_{-L}^{L} f(x)\cos\left(\frac{n\pi x}{L}\right)dx$$

$$b_n = \frac{1}{L}\int_{-L}^{L} f(x)\sin\left(\frac{n\pi x}{L}\right)dx$$

$$a_n = \frac{1}{\pi}\int_{0}^{\pi} x\cos(nx)\,dx + \frac{1}{\pi}\int_{-\pi}^{0} \pi\cos(nx)\,dx$$

$$= \frac{1}{\pi}\ \frac{1}{x^2}\cos(nx) - \frac{x\sin(nx)}{n}\Bigg|_0^{\pi} + \quad \frac{\sin(nx)}{n}\Bigg|_{-\pi}^{0}$$

$$=$$

$$F_c(w) = \int_{-c}^{c} a(w) e^{iw} dw$$

$$a(w) = \frac{1}{2\pi} \int_0^1 v e^{iwv} dv$$

$$= \frac{1}{2\pi} \frac{e^{iwv}(iwv - 1)}{(iw)^2} \Big|_0^1$$