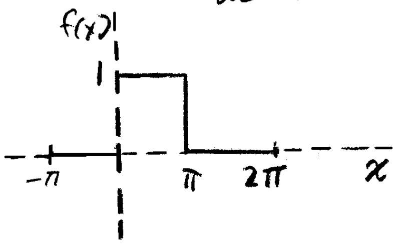
RJP 7.21

Expand $f(x)$ in Fig 5.1 p 353.

Use (7.6) to find coefs.:



$$c_n = \frac{1}{2\pi}\int_{-\pi}^{0} e^{-inx}\cdot 0\cdot dx + \frac{1}{2\pi}\int_0^{\pi} e^{-inx}\cdot 1\cdot dx$$

$$= \frac{1}{2\pi}\left[\frac{e^{-inx}}{-in}\right]_0^{\pi}$$

$$= -\frac{1}{2\pi i n}\left(e^{-in\pi}-1\right) = \begin{cases} \frac{i}{\pi i n} * & \text{odd} = n \\ 0 & n = \text{even} \neq 0 \end{cases}$$

WARNING, must find c_0 separately here:

$$c_0 = \frac{1}{2\pi}\int_0^{\pi} dx = \frac{1}{2}$$

Then

$$f(x) = \sum_{-\infty}^{\infty} c_n e^{inx}$$

$$= \frac{1}{2} + \frac{1}{i\pi}\left(\frac{e^{ix}}{1} + \frac{e^{3ix}}{3} + \frac{e^{5ix}}{5} + \cdots\right)$$

$$+ \frac{1}{i\pi}\left(\frac{e^{-ix}}{-1} + \frac{e^{-3ix}}{-3} + \frac{e^{-5ix}}{-5} + \cdots\right)$$

* Using (2-10.2) & (2-11.2):

$$e^{-in\pi} = \cos(n\pi) - i\,\underbrace{\sin(n\pi)}_{=0} = -1 \quad \text{for } n \text{ odd}$$

$$\cos 2\pi - i\,\underbrace{\sin 2\pi}_{=0} = 1 \quad \text{for } n \text{ even}$$

So

$$c_n = -\frac{1}{2\pi i n}(-1-1) = -\frac{1}{2\pi i n}(-2) = \frac{1}{\pi i n}, \quad n \text{ odd}$$

$$c_n = -\frac{1}{2\pi i n}(1-1) = 0 \quad \text{for } n \text{ even}$$