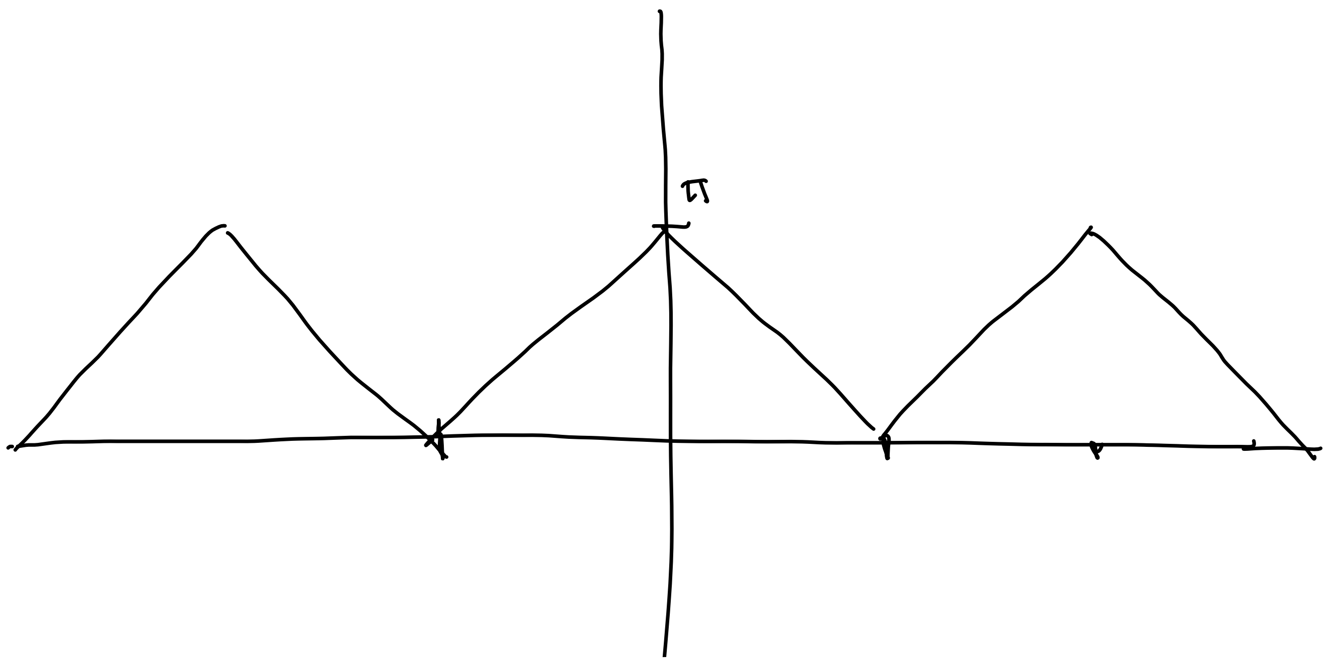

$$a_0 = \frac{1}{\pi}\int_{-\pi}^{\pi} f(t)\,dt = \frac{1}{\pi}\int_{-\pi}^{0}(\pi + t)\,dt + \frac{1}{\pi}\int_{0}^{\pi}(\pi - t)\,dt$$

$$= \frac{1}{\pi}\left(\pi t + \tfrac{1}{2}t^2\Big|_{-\pi}^{0} + \pi t - \tfrac{1}{2}t^2\Big|_{0}^{\pi}\right)$$

$$= \frac{1}{\pi}\left[\left(0 - \left(-\pi^2 + \tfrac{1}{2}\pi^2\right)\right) + \left(\pi^2 - \tfrac{1}{2}\pi^2\right)\right]$$

$$= \frac{1}{\pi}\left(2\pi^2 - \pi^2\right)$$

$$= \pi$$

$$a_n = \frac{1}{\pi}\int_{-\pi}^{\pi} f(t)\cos(nt)\,dt$$

$$= \frac{1}{\pi}\int_{-\pi}^{0} \pi\cos(nt) + t\cos(nt)\,dt$$

use integration by parts

$$+ \frac{1}{\pi}\int_{0}^{\pi} \pi\cos(nt) - t\cos(nt)\,dt$$

$$= \frac{1}{\pi}\left(\frac{1-\cos(\pi n)}{n^2} + \frac{1-\cos(\pi n)}{n^2}\right) = \frac{2}{\pi}\,\frac{1-\cos(\pi n)}{n^2}$$

$$b_n = \frac{1}{\pi}\int_{-\pi}^{\pi} f(t)\sin(nt)\,dt$$

$$= \frac{1}{\pi}\int_{-\pi}^{0} \pi\sin(nt) + t\sin(nt)\,dt$$

Integration by parts

$$+ \frac{1}{\pi}\int_{0}^{\pi} \pi\sin(nt) - t\sin(nt)\,dt$$

$$= \frac{1}{\pi}\left(\frac{\sin(n\pi) - \pi n}{n^2} + \frac{\pi n - \sin(n\pi)}{n^2}\right)$$

$$= 0$$

So

$$f(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos(nt) + b_n \sin(nt)$$

$$= \frac{\pi}{2} + \sum_{n=1}^{\infty} \left[\frac{2}{\pi} \left(\frac{1-\cos(n\pi)}{n^2} \right) \cos(nt) + \cancel{0 \cdot \sin(nt)} \right]$$

$$= \frac{\pi}{2} + \sum_{n \text{ odd}} \frac{2}{\pi} \cdot \frac{2}{n^2} \cos(nt)$$

$$= \frac{\pi}{2} + \frac{4}{\pi} \cos(t) + \frac{4}{\pi 9} \cos(3t) + \frac{4}{\pi 25} \cos(5t) + \dots$$

At $t = 0$

$$\frac{\pi}{2} + \sum_{n \text{ odd}} \frac{4}{\pi} \cdot \frac{1}{n^2}$$

$$\frac{\pi}{2} + \frac{4}{\pi} \sum_{n \text{ odd}} \frac{1}{n^2}$$

$$\frac{\pi}{2} + \frac{4}{\pi}\left(\frac{\pi^2}{8}\right) = \frac{\pi}{2} + \frac{\pi}{2}$$

$$= \pi$$