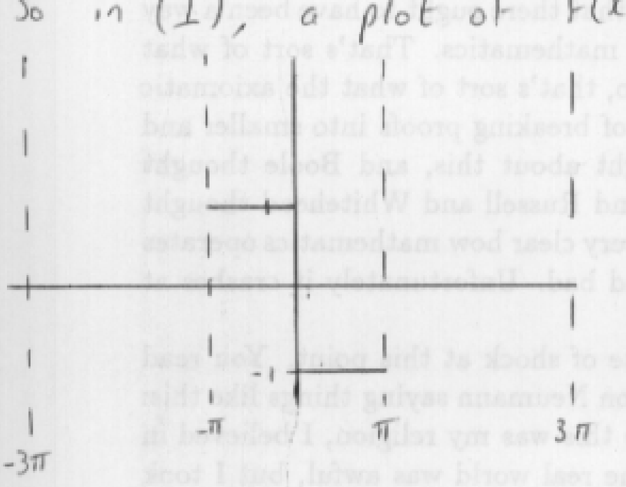
So $F(x) = \frac{\pi}{2} + \sum_{n=1}^{\infty} \frac{2}{n^2\pi}\left((-1)^n - 1\right)\cos nx$

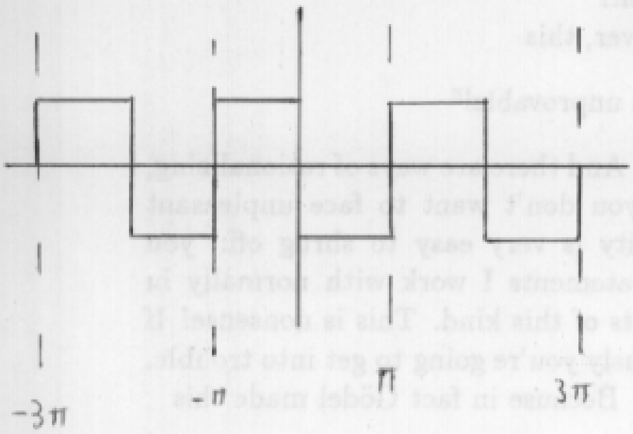
Across the interval $[-\pi, \pi]$, the Fourier series recreate $F(x)$ perfectly. However, the series is periodic in x, so it also recreates copies of $F(x)$ in the interval $[\pi, 3\pi]$ and $[-3\pi, -\pi]$.

However the functions $\sin nx$ and $\cos nx$ are smooth and continuous. We can't represent discontinuities, ie jumps from one value to another, with them. So when we plot the Fourier series of a discontinuous function, like $F(x) = \begin{cases} 1 & -\pi < x < 0 \\ -1 & 0 < x < \pi \end{cases}$, the plot includes lines that join the discontinuous points.

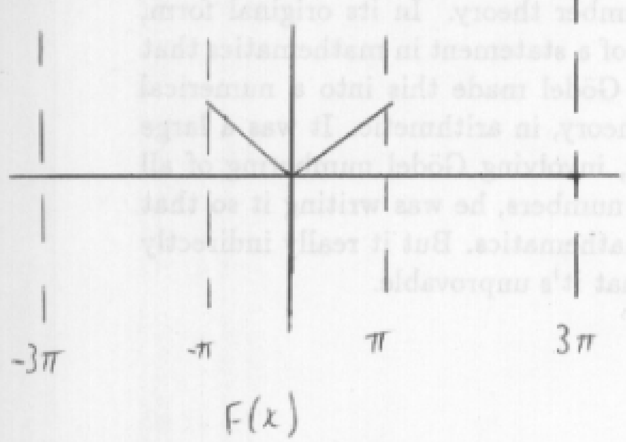
So in (I), a plot of $F(x)$ looks like



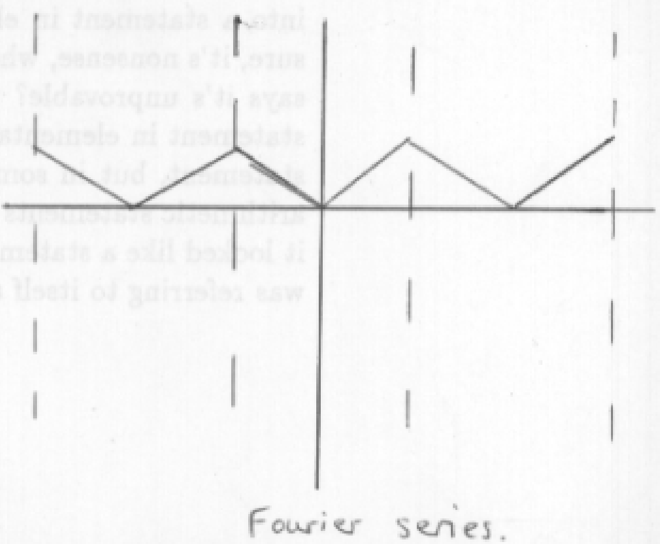
A plot of the Fourier series of $F(x)$ looks like



In (II), a plot of $F(x)$ looks like. However a plot of the Fourier Series looks like



$F(x)$



Fourier series.