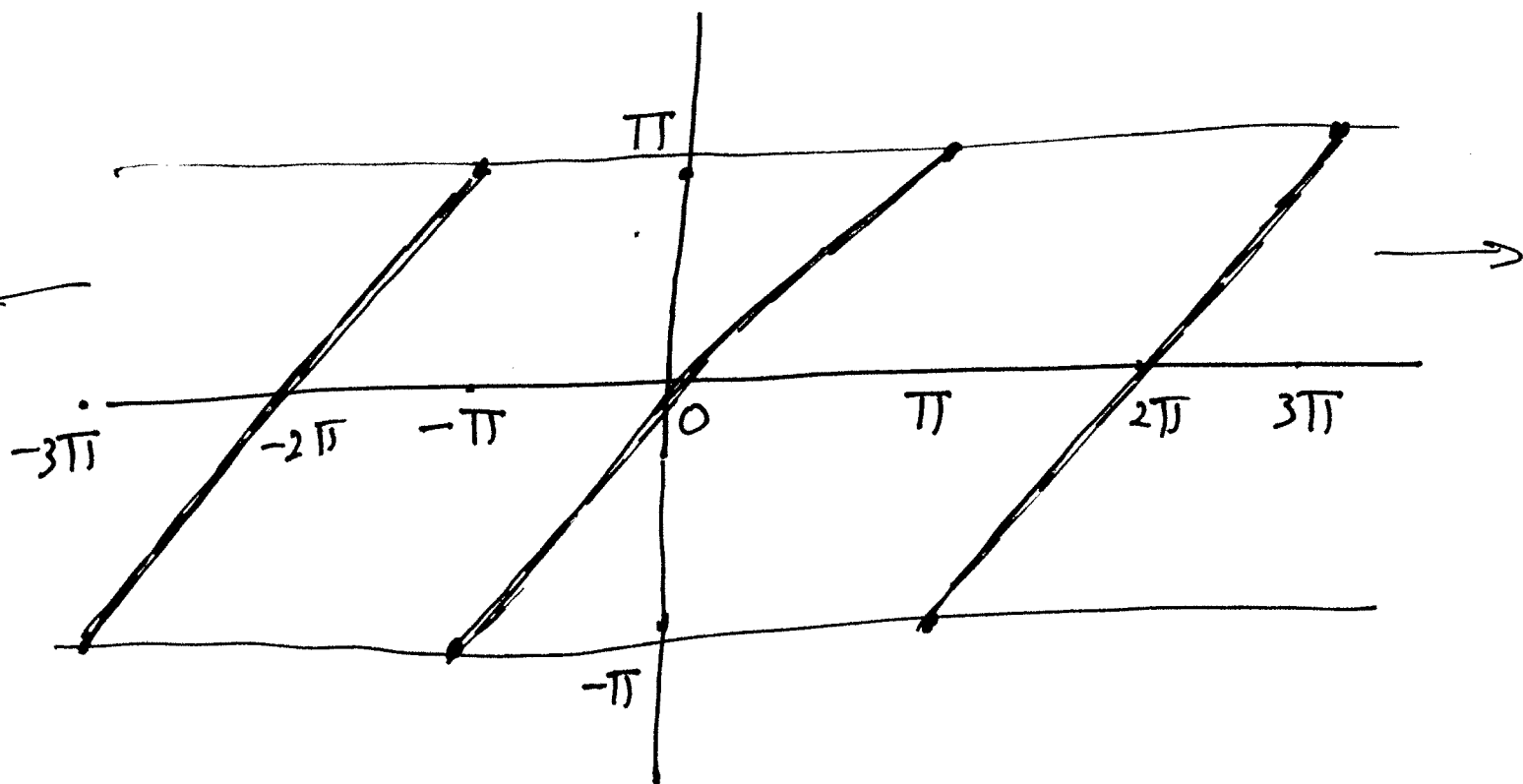# Final Exam

Math 3350

① A periodic function $f(x)$ of period 2π ~~not~~ is defined in the interval $(-\pi, \pi)$ as follows:

$$f(x) = x, \quad -\pi < x < \pi.$$

The function has a graph as shown

ⓐ Calculate the Fourier series Expansion of $f(x)$.

ⓑ Evaluating $f(x)$ at $x = \pi/2$, show that

$$\tfrac{1}{2} = 1 - \tfrac{1}{3} + \tfrac{1}{5} - \tfrac{1}{7} \cdots .$$

(2) Solve the following 2nd order equation:

$$\frac{d^2 y}{dt^2} + 2y = \sin 5t$$

where

$$y(0) = 0 \, ; \quad \dot{y}(0) = 1$$

③ Solve the following 1st order equation

$$\left(\sin y - x^2 e^{-x}\right) dx + \left(\cos y - y^2 e^{-x}\right) dy = 0$$