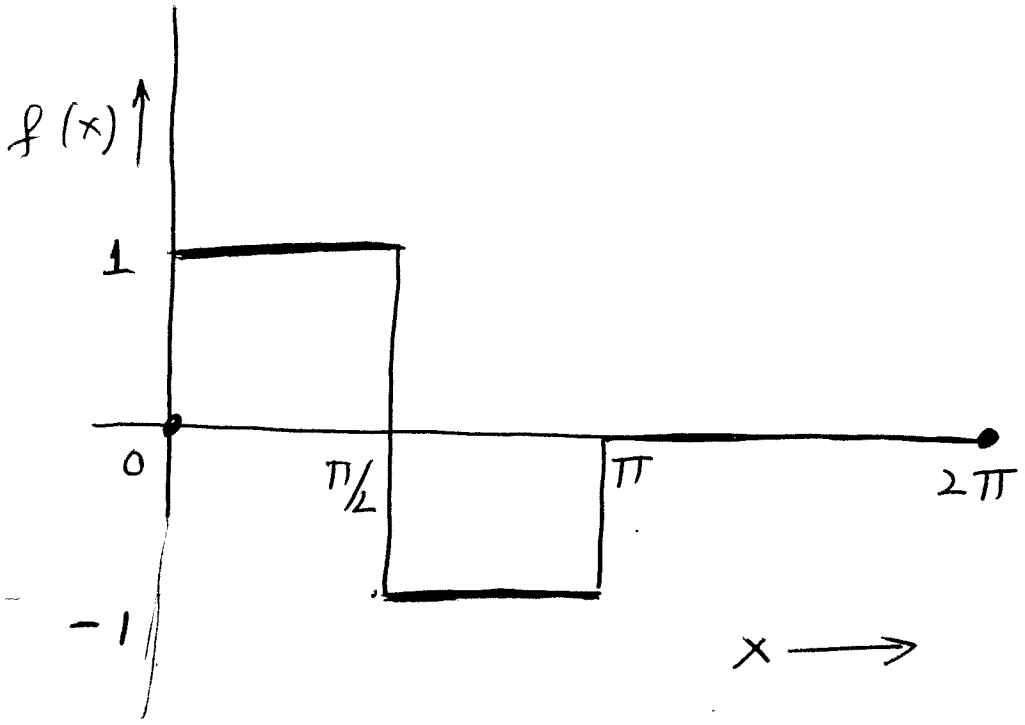
Third Test

Good Luck

Math 3350

(1)



We have a function $f(x)$ defined in the interval $[0, 2\pi]$ as shown above.

Assume that

$$f(x+2\pi) = f(x) \quad \text{for all } x$$

ie $f(x)$ has a period 2π. Calculate the Fourier Series Expansion.

(2) consider the following differential equation

$$\frac{d^2y}{dx^2} + 10\frac{dy}{dx} + 21y = f(x).$$

choose

$$f(x) = 1 \quad \text{for } x \geq 10$$
$$= 0 \quad \text{for } x < 10$$

choose

$$y(0) = 0, \quad \frac{dy(0)}{dx} = 10$$

calculate $y(x)$.

(3) calculate Laplace inverse of

$$\frac{3s+2}{s^2+4s+5}$$

(4) for the differential equation

$$\frac{d^2y}{dx^2} + \alpha \frac{dy}{dx} + \beta y = 0$$

we do not know α, β but we know that for some initial condition $y(0), \frac{dy(0)}{dx}$ the solution contains a term

$$y(x) = A e^{-5x} \cos 7x + \text{another term}.$$

(a) calculate α and β if possible.

(b) calculate the other term in $y(x)$ if possible