Mid Semester Exam

Instructor: Dr. Rajesh Kumble Nayak
10:00 AM, 7th October 2023.
Duration: 60 + 30 Minutes.

- Answer all the question.
- No calculators are allowed!
- Good luck

Q - 1: [20 Marks] Plot the function

$$f(x) = e^{-\frac{1}{x}},$$

In an appropriate domain.

Q - 2: [20 Marks] Find the Fourier series expansion of the function

$$f(x) = \begin{cases} \pi + x & -\pi \leq x < 0 \\ \\ \pi - x & 0 < x \leq \pi \end{cases},$$

Make plot of function $f(x)$, first two individual terms and the partial sum of two terms.

Q - 3: [20 Marks] A string of length L is fixed at both end is left with an initial shape given by the function $\psi_0(x)$, the initial velocity of the string is zero *i.e.* $\left.\frac{\partial\psi(x,t)}{\partial t}\right|_{t=0} = 0$. Find the amplitude of string, $\psi(x,t)$ as function of position and time.

Q - 4: [20 Marks] If $p(x)$ is the probability density function, then the mean of the distribution is given by

$$\mu = \int_{-\infty}^{+\infty} xp(x)\,dx\,.$$

Explicitly compute the mean for the distribution given below

$$p(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}(x-2)^2}\,.$$

It is given that $\int_{-\infty}^{+\infty} p(x)dx = 1$.