Steps for Implementing PINNs

1. Problem Formulation

We solve for F_n under the law:

$$F_n = k \cdot m_{\text{object}} \cdot m_n \cdot r^{n-1}$$

Where:

- Inputs: $n, r, m_{\text{object}}, g$
- Output: F_n

Governing Equation: The physics-informed loss ensures the network satisfies:

$$F_n - k \cdot m_{\text{object}} \cdot m_n \cdot r^{n-1} = 0$$

2. PINN Architecture

Components:

- Inputs: Numerical values for $n, r, m_{\text{object}}, g$
- Physics-Informed Loss: Combines data-driven loss (MSE) and physics loss.
- Output Layer: Single node for F_n.

Loss Function:

$$L = L_{\text{data}} + \lambda \cdot L_{\text{physics}}$$

Where:

$$L_{\text{data}} = \text{MSE}(\hat{F}_n, F_n)$$

$$L_{\text{physics}} = \text{MSE}(\hat{F}_n - k \cdot m_{\text{object}} \cdot m_n \cdot r^{n-1}, 0)$$