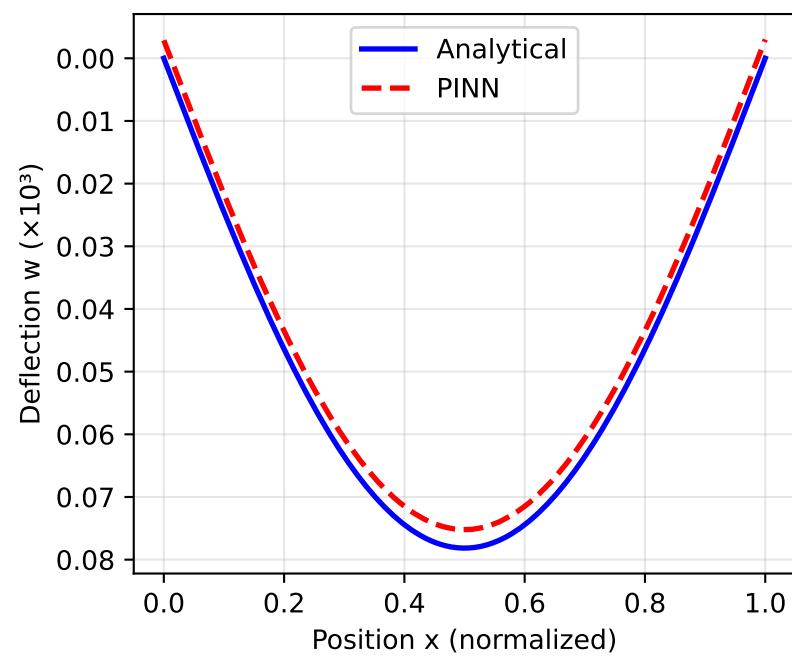


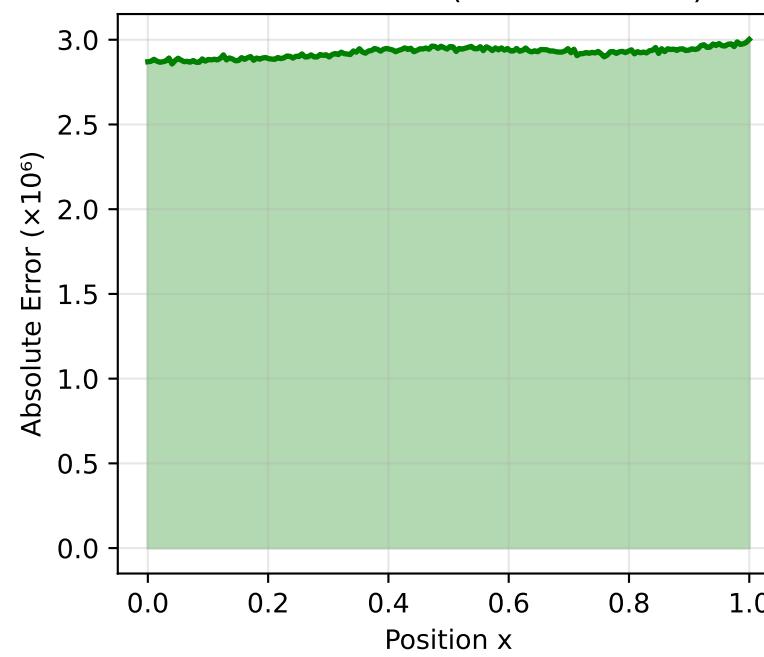
PINN Solution: Euler-Bernoulli Beam Deflection

$$EI \frac{d^4 w}{dx^4} = q(x) \quad \text{— Simply-Supported Beam with Uniform Load}$$

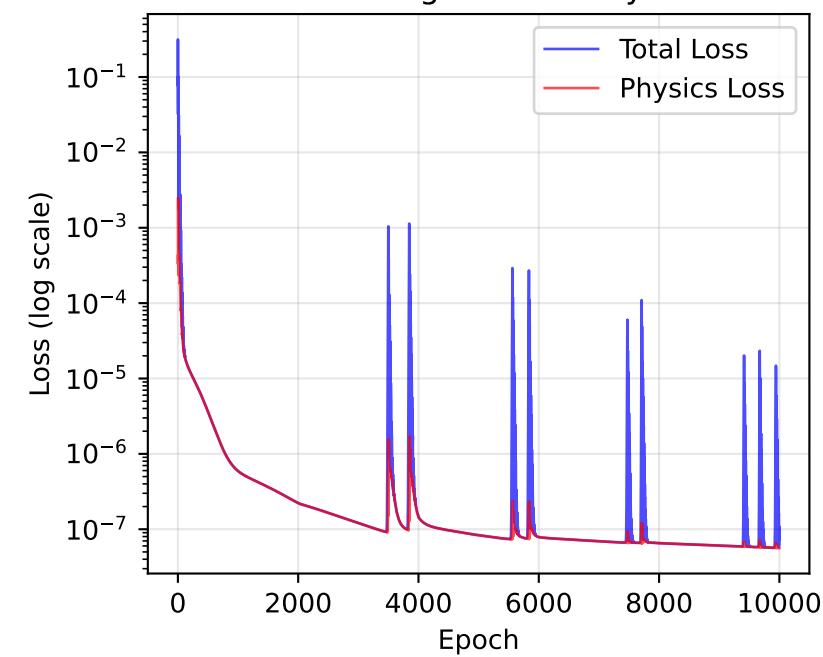
Beam Deflection Curve



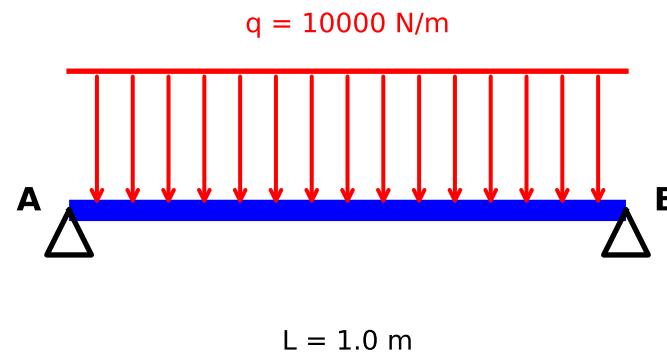
Prediction Error (Max: 3.00e-06)



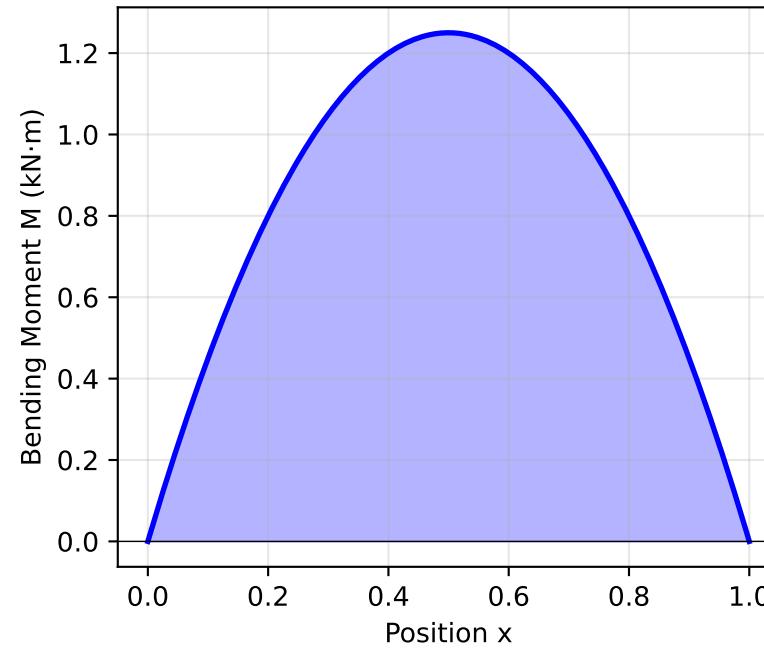
Training Loss History



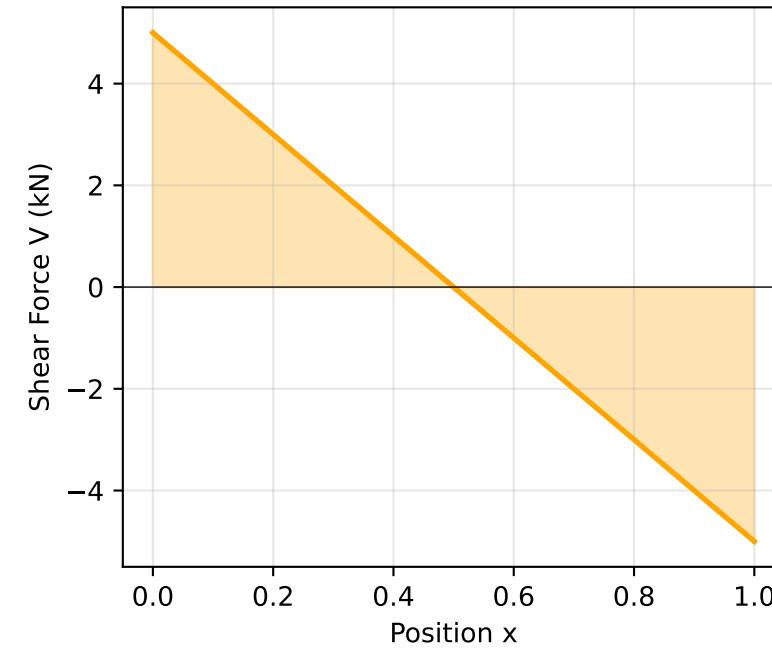
Problem Setup: Simply-Supported Beam



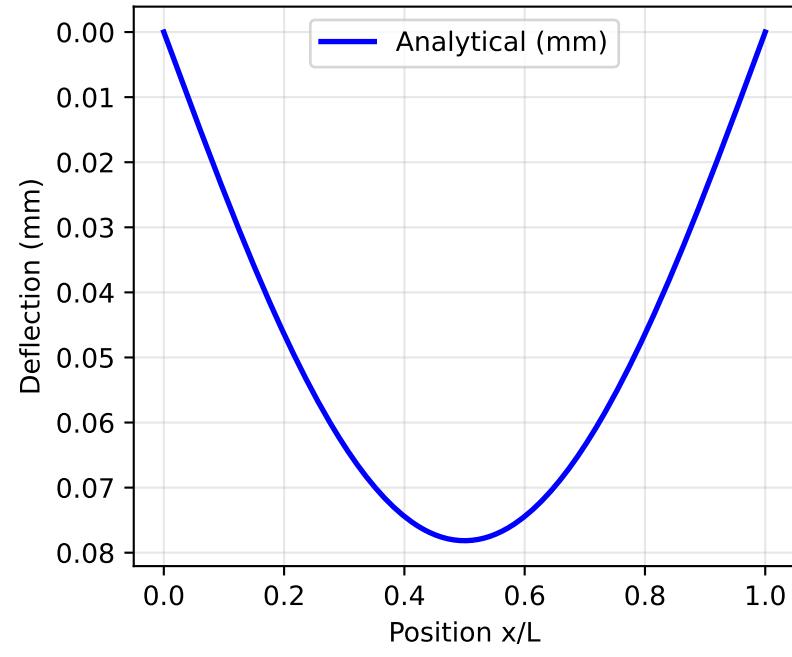
Bending Moment Diagram



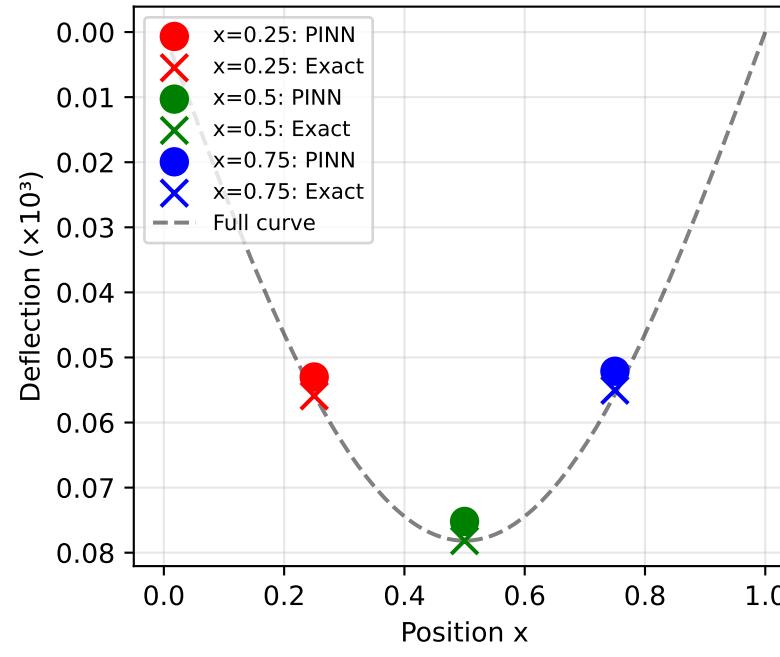
Shear Force Diagram



Physical Deflection (max: 0.0782 mm)



Point-wise Comparison



Beam Deflection PINN Results

Problem: Euler-Bernoulli Beam
 $EI \times d^4 w / dx^4 = q(x)$

Beam Properties:
- Length: $L = 1.0$ m
- Young's Modulus: $E = 200$ GPa
- Moment of Inertia: $I = 8.33 \times 10^{-6}$ m 4
- Uniform Load: $q = 10000$ N/m

Boundary Conditions:
- Simply-supported (pin-pin)
- $w(0) = w(L) = 0$
- $M(0) = M(L) = 0$

Accuracy Metrics:
- R² Score: 0.985389
- Mean Squared Error: 8.56e-12
- Maximum Error: 3.00e-06

Max Deflection (analytical):
0.078156 mm at $x=L/2$