4-45. Determine the shear and moment in the beam as a function of $x$.

Prob. 4-45

**Entire Beam:**

\[ F_x = \int_0^x 1.5x^2 \, dx = \frac{1.5x^3}{3} \bigg|_0^x = 0.5x^3 \bigg|_0^x = 500 \text{ kN} \]

From the table on the inside back cover, the centroid of the parabola is \( \frac{1}{4} (10 \text{ m}) = 2.5 \text{ m} \) from $B$.

\[ \sum F_x = 0; \quad A_x = 0 \]

\[ (\sum M_y = 0; \quad -A_y (10) + 500(2.5) = 0; \quad A_y = 125 \text{ kN} \]

**Segment:**

\[ F_x = \int_0^x 1.5x^2 \, dx = \frac{1.5x^3}{3} \bigg|_0^x = 0.5x^3 \]

\[ (- \sum F_x = 0; \quad -V - 0.5x^3 + 125 = 0 \]

\[ V = -0.5x^3 + 125 \quad \text{Ans} \]

\[ (\sum M_x = 0; \quad M + 0.5x^2 \left( \frac{1}{4} \right) - 125x = 0 \]

\[ M = -0.125x^3 + 125x \quad \text{Ans} \]
4-47. Draw the shear and moment diagrams for each member of the frame. Assume the joint at B is a pin and support C is a roller.
4-55. Draw the shear and moment diagrams for each member of the frame. The joint at \( B \) is fixed connected.

Frame:

\[ +\Sigma M_C = 0: \]
\[ 20 \text{ kN} \cdot \text{m} (2.5 \text{ m}) - A_y (8 \text{ m}) = 0 \]
\[ A_y = 6.25 \text{ kN} \]

\[ +\Sigma F_y = 0; \]
\[ -20 \text{ kN} + 6.25 \text{ kN} + C_y = 0 \]
\[ C_y = 13.75 \text{ kN} \]

\[ -\Sigma F_z = 0; \]
\[ C_z = 0 \]

Member \( BC \):

Member \( AB \):