Announcements

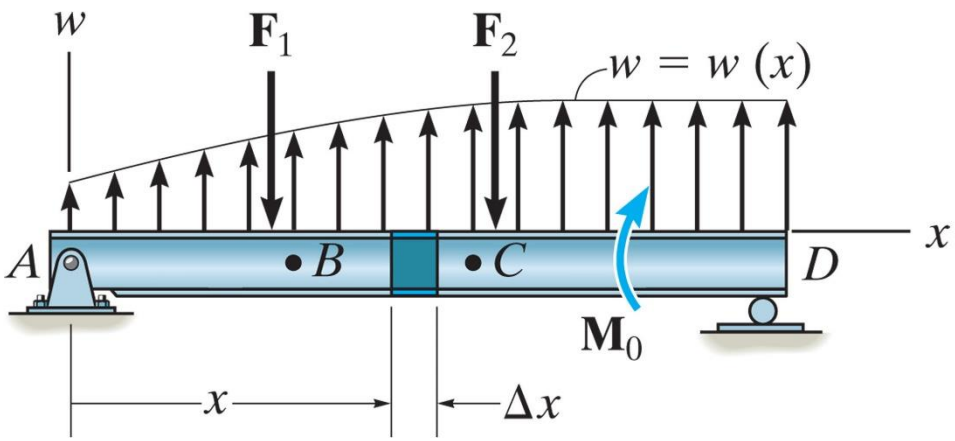
- Quiz 4 this Friday (10/26) in class
- Concept Inventory & Visual Representation Study:
  - Next Thursday–Saturday (11/1–3) at CBTF
  - 2 assessments in 1 session
  - Must take both assessments to receive extra credit (1% of overall grade)

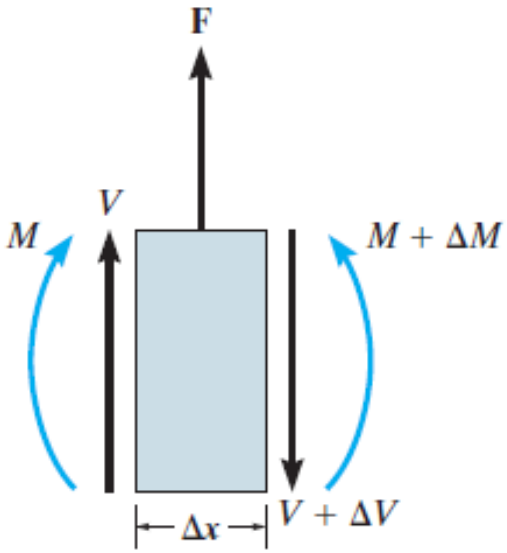
- Upcoming deadlines:
- Thursday (10/24)
  - PL HW16

Objective

- Relations among external load (distributed force, concentrated force, couple moment) and internal load (shear force and bending moments)

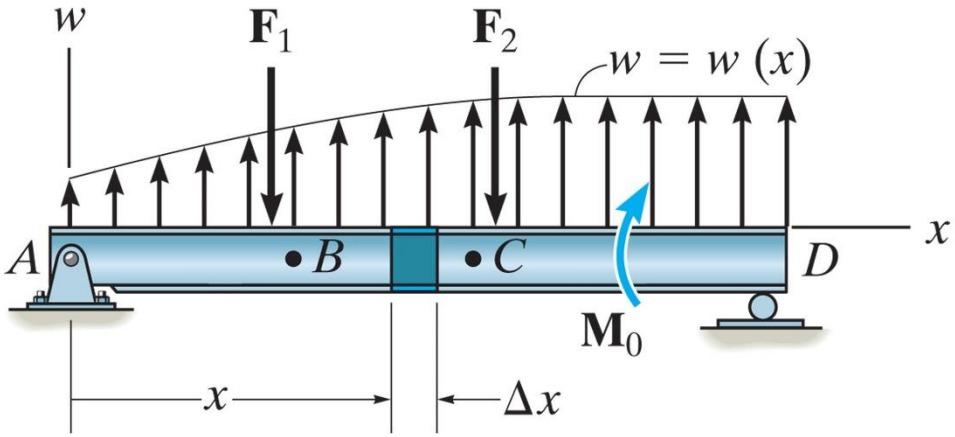
Relations Among Load, Shear and Bending Moments

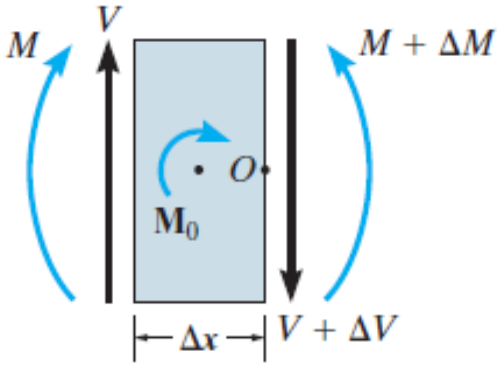




Wherever there is an external concentrated force, there will be a change (jump) in internal shear force.

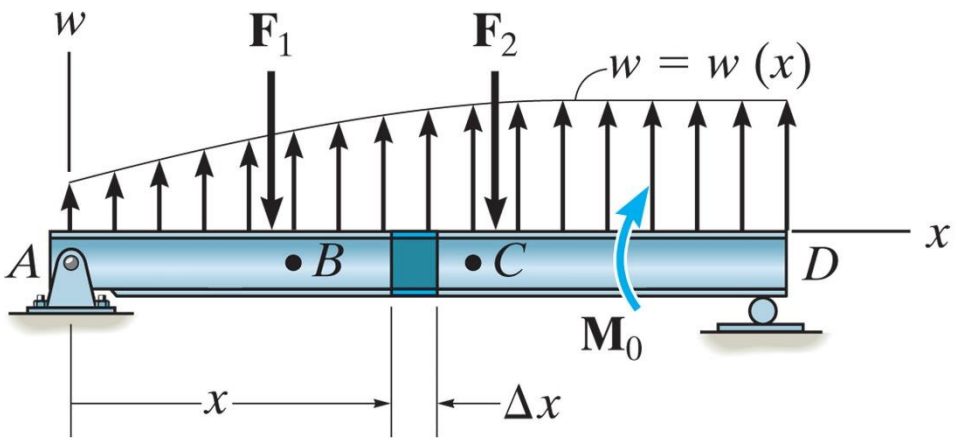
Relations Among Load, Shear and Bending Moments

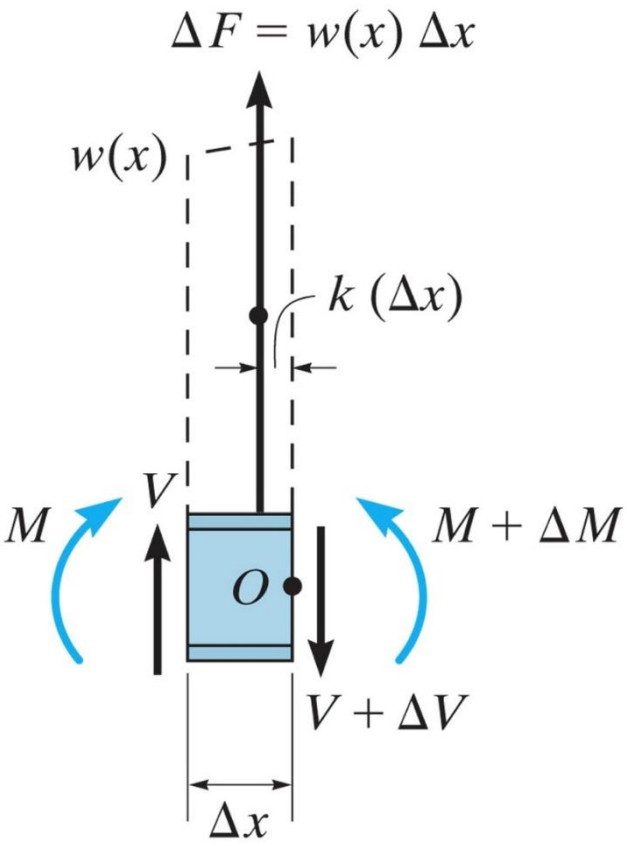




Wherever there is an external couple moment, there will be a change (jump) in internal bending moment.

Relations Among Load, Shear and Bending Moments





Relationship between load and shear:

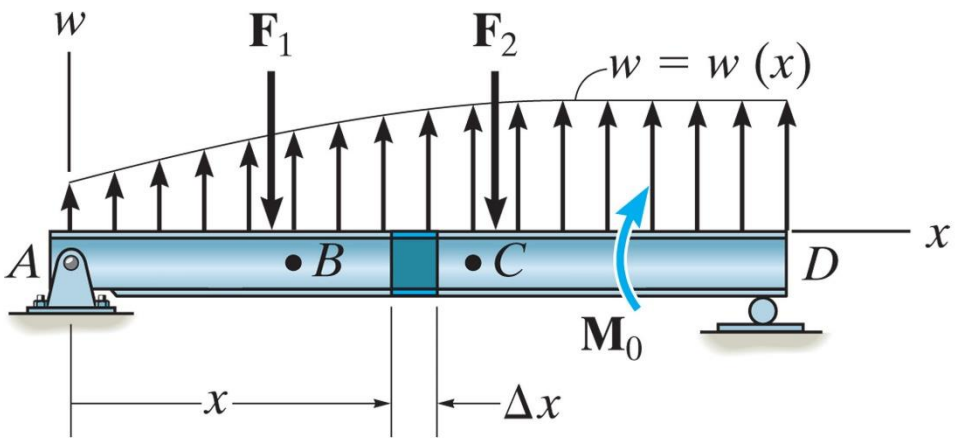
$$\sum F_y = 0: \quad V - (V + \Delta V) + w\Delta x = 0$$

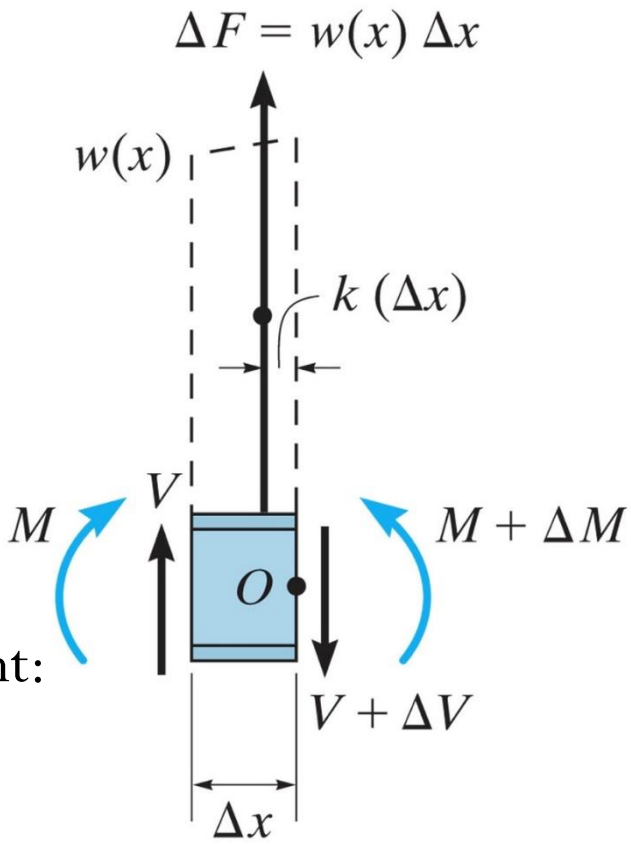
$$\Delta V = w\Delta x$$

Dividing by Δx and letting $\Delta x \to 0$, we get:

$$\frac{dV}{dx} = w \qquad \Delta V = \int w\, dx$$

Relations Among Load, Shear and Bending Moments





Relationship between shear and bending moment:

$$\sum M_O = 0: \quad (M + \Delta M) - M - V\,\Delta x - w\,\Delta x\,(k\,\Delta x) = 0$$

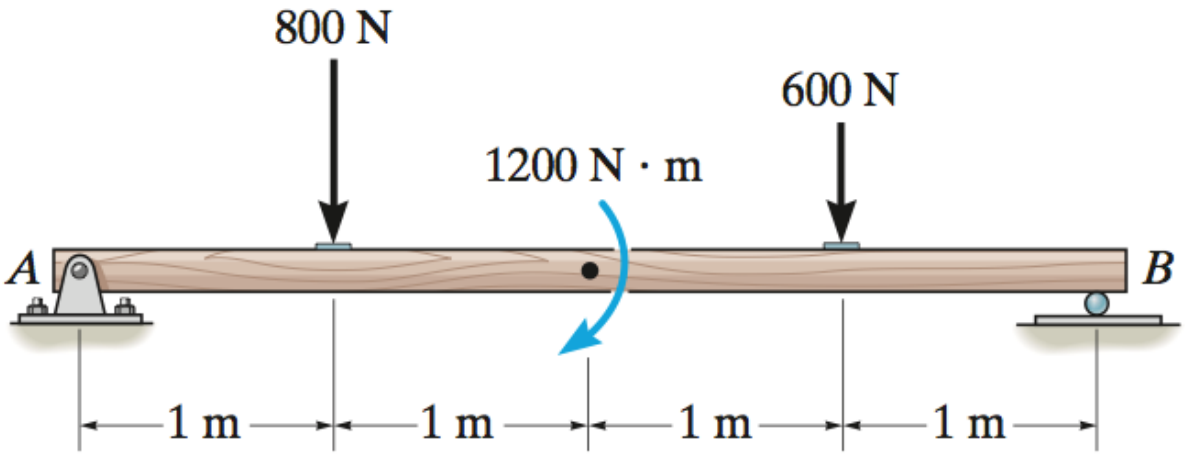
$$\Delta M = V\,\Delta x + w k (\Delta x)^2$$

Dividing by Δx and letting $\Delta x \to 0$, we get:

$$\frac{dM}{dx} = V \qquad \Delta M = \int V\,dx$$

Example

Draw the shear and moment diagrams for the beam.



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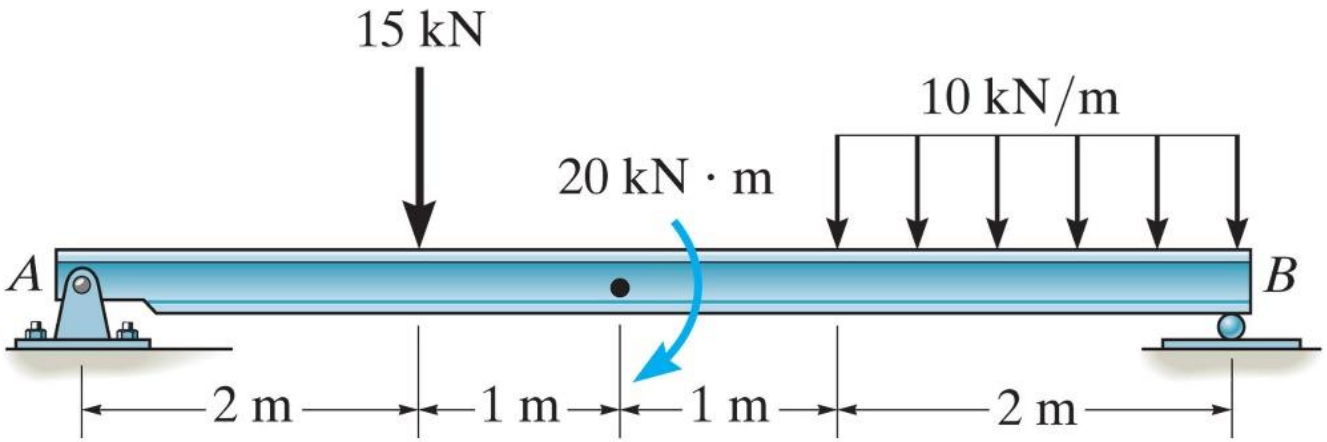

Example

Draw the shear force and bending moment diagrams for the beam.

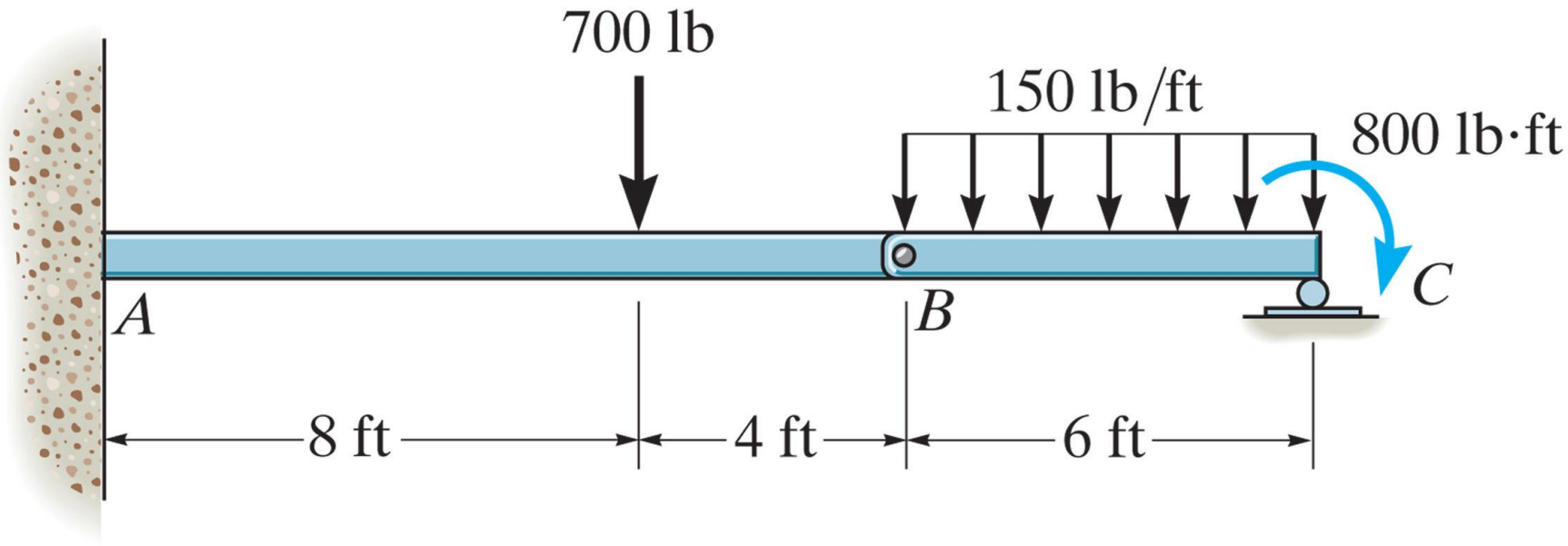

Figure: 07_P081

Example

Draw the shear force and bending moment diagrams for the beam.