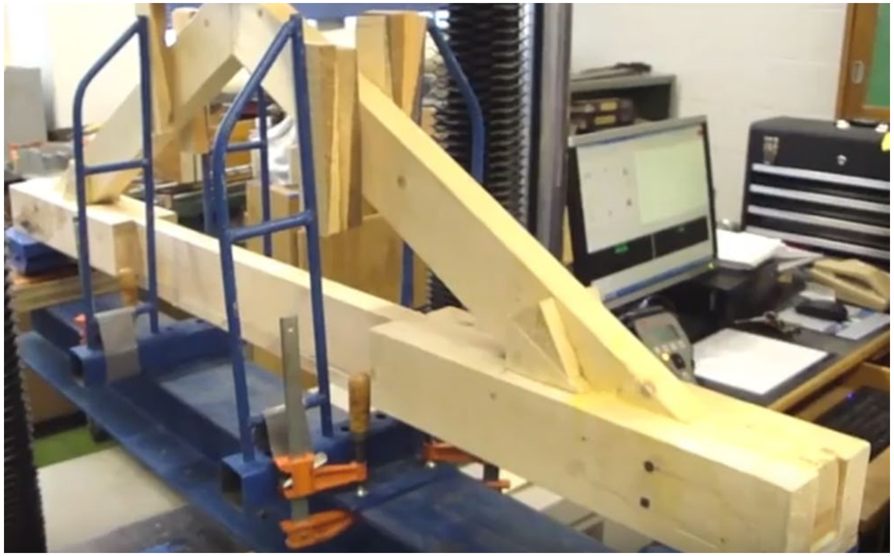
Announcements

- Quiz 4 retry: Thursday (3/14) is the last day
- TAM 210/211 students – check your grades on Compass

- Upcoming deadlines:
- Friday (3/15)
  - PL HW
  - Written Assignment

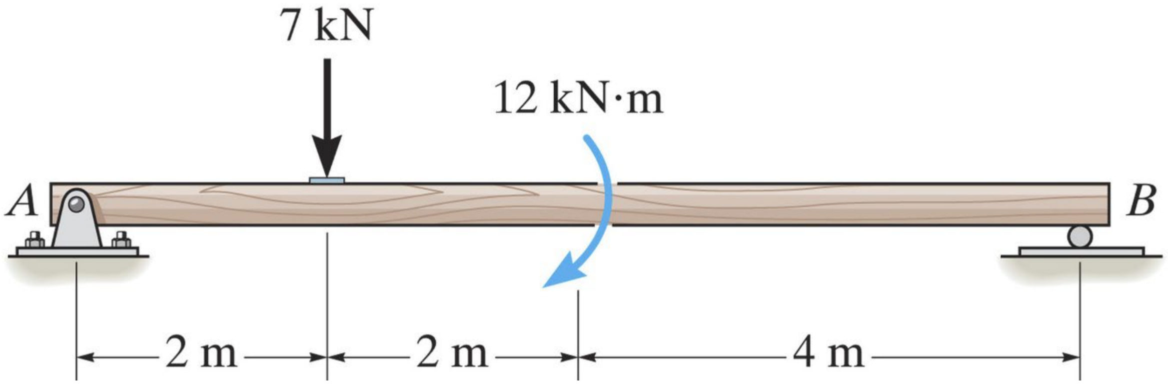
Objective

- Deriving equations for shear and bending moment diagrams
- Relate internal shear force to bending moment



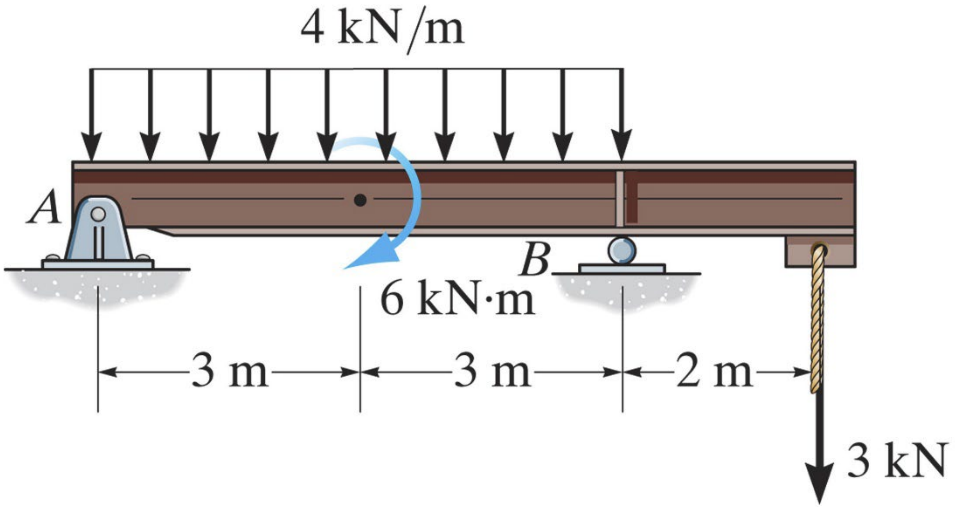
Example

Draw the moment diagrams for the beam.



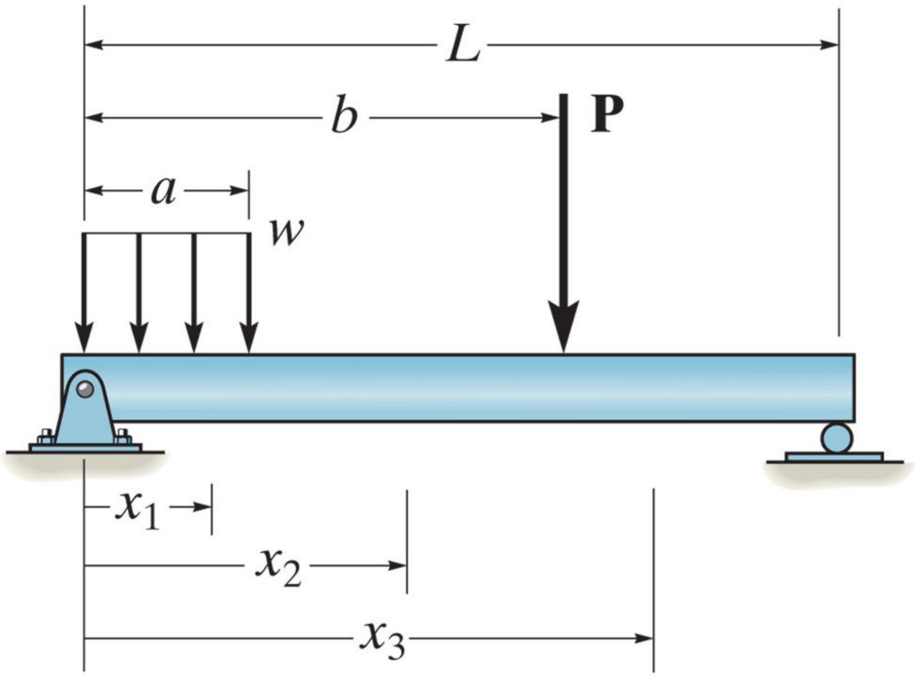
Example

Draw the shear and moment diagrams for the beam.

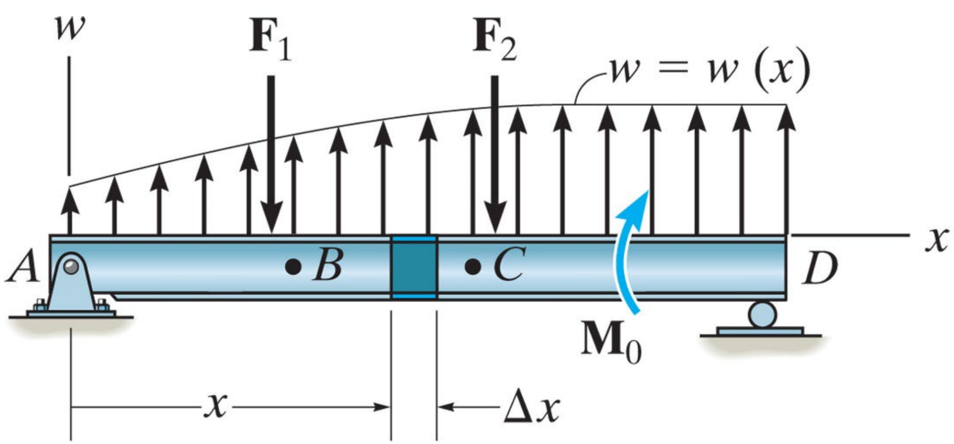


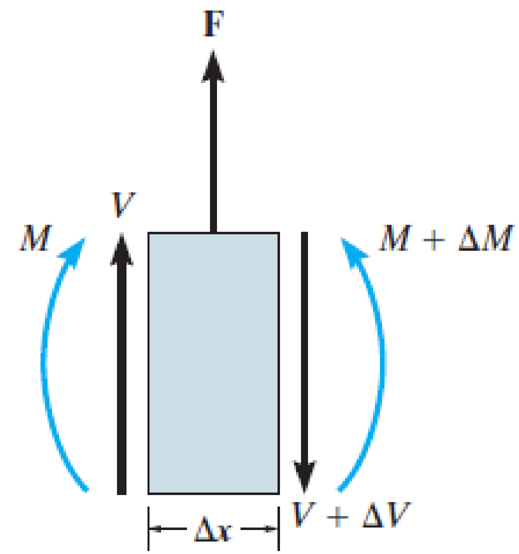
Relationships between w, V, M

Draw the shear and moment diagrams for the beam.



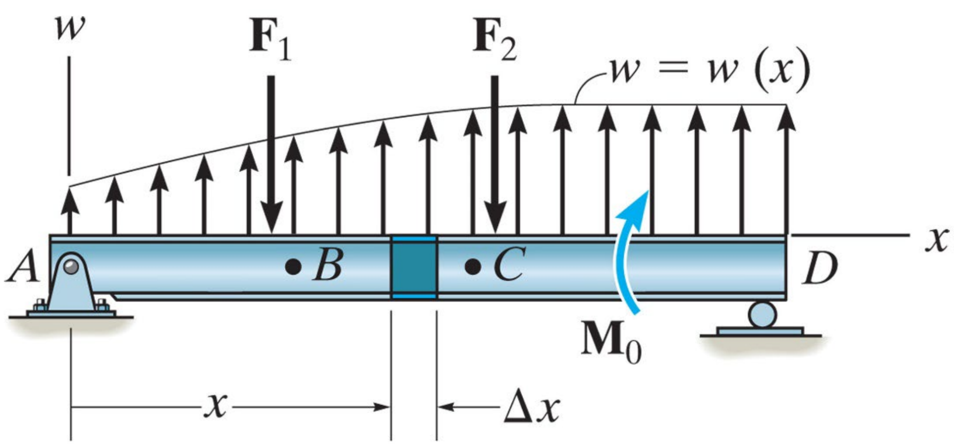
Relations Among Load, Shear and Bending Moments

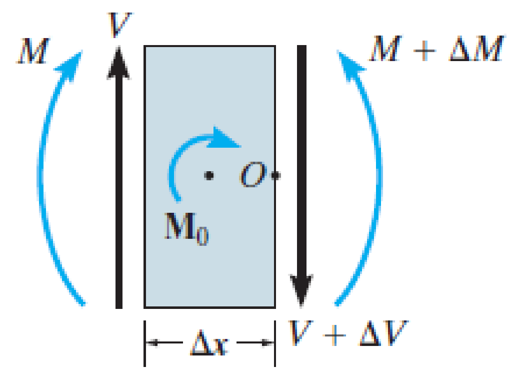




Wherever there is an external concentrated force, there will be a change (jump) in internal shear force.

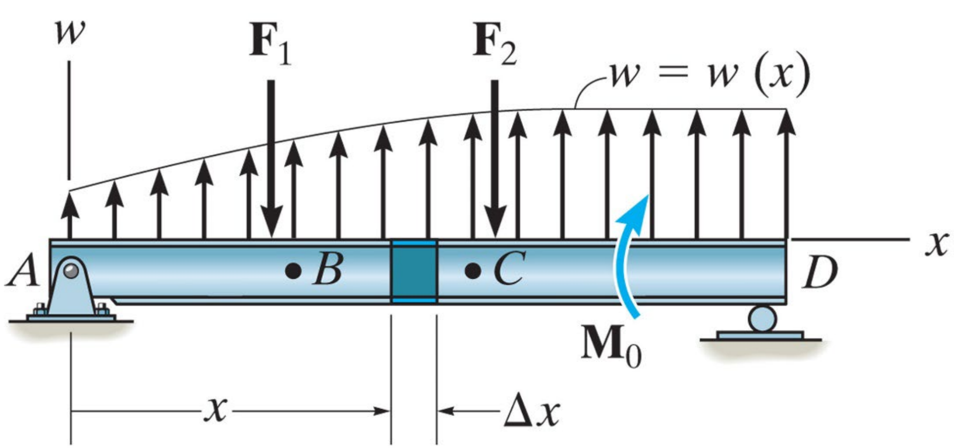
Relations Among Load, Shear and Bending Moments

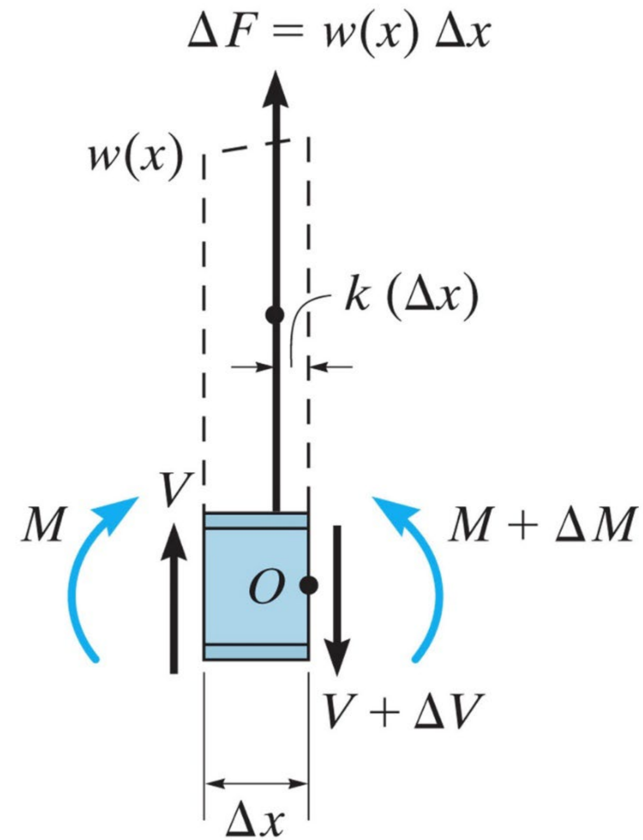




Wherever there is an external couple moment, there will be a change (jump) in internal bending moment.

Relations Among Load, Shear and Bending Moments





Relationship between load and shear:

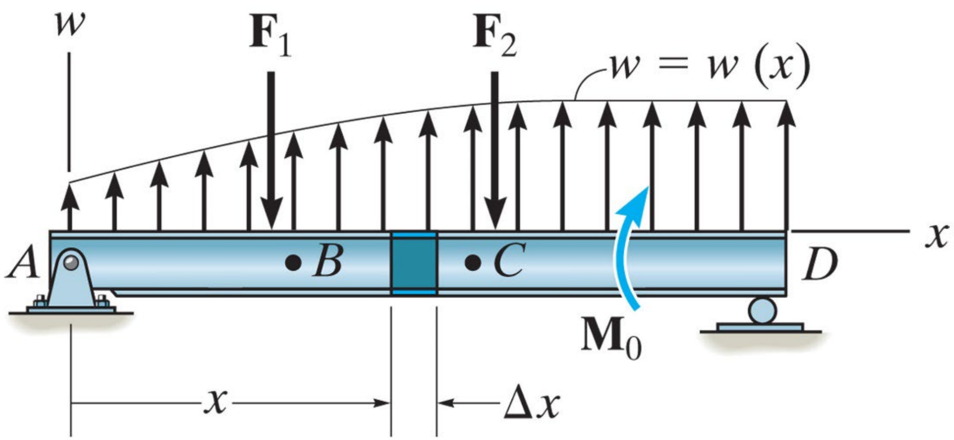
$$\sum F_y = 0: \quad V - (V + \Delta V) + w\Delta x = 0$$

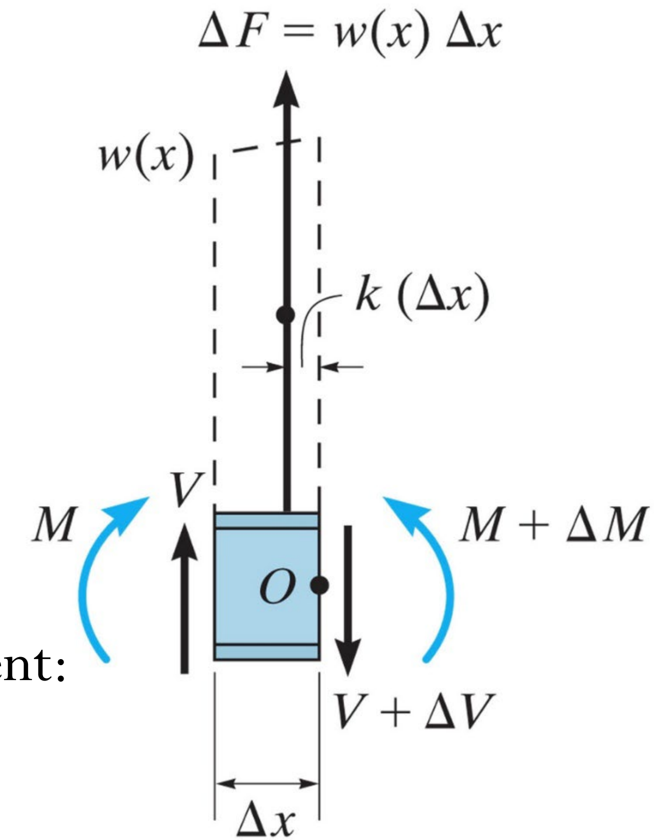
$$\Delta V = w\Delta x$$

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 $\Delta x \rightarrow 0$, we get:

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