Announcements

- TAM 210/211 students – check your grades on Compass
- Written Assignment 6 regrade submission
- 1 written assignment "accident forgiveness"

Happy Pear Helene Day!

- Upcoming deadlines:
- Friday (3/15) – Today!
  - PL HW 8
  - Written Assignment

1

Objective

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

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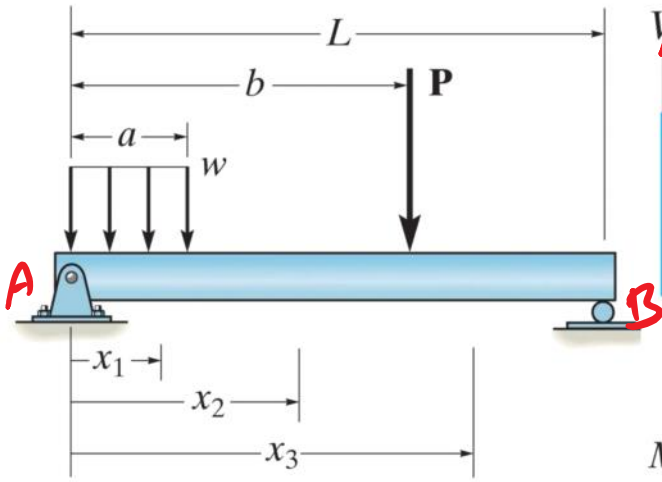
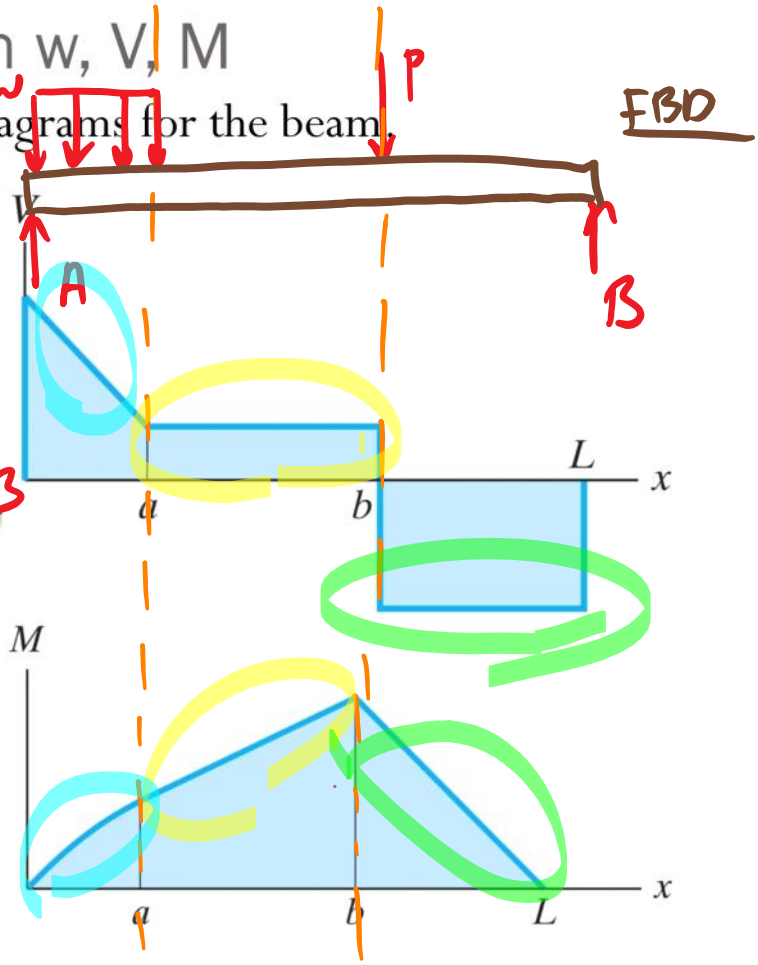
Relationships between w, V, M

Draw the shear and moment diagrams for the beam.





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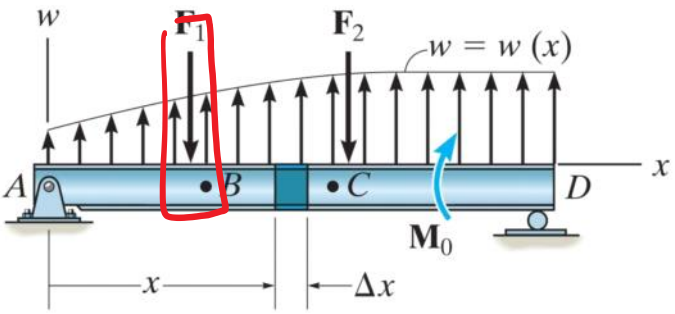
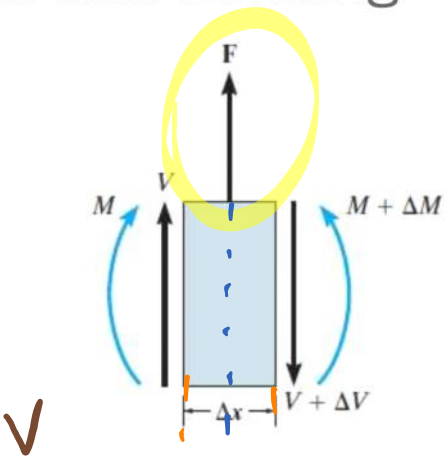
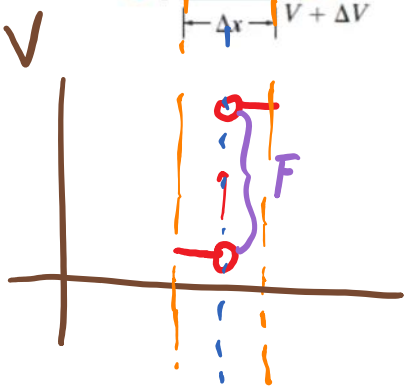
Relations Among Load, Shear and Bending Moments





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



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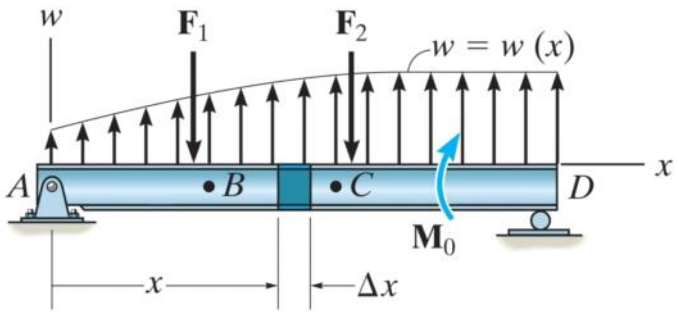
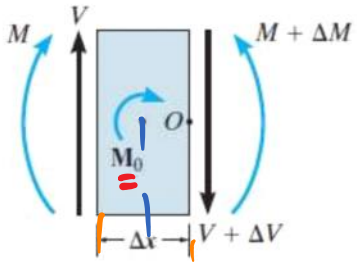
Relations Among Load, Shear and Bending Moments





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

upward jump = clockwise ext. moment.

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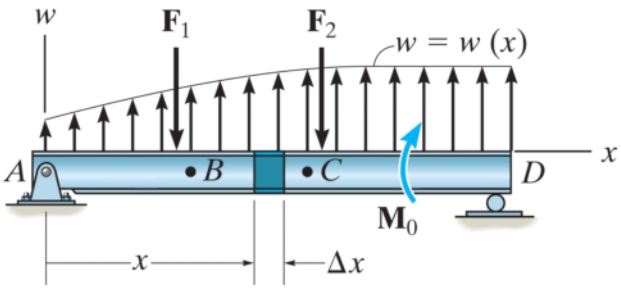
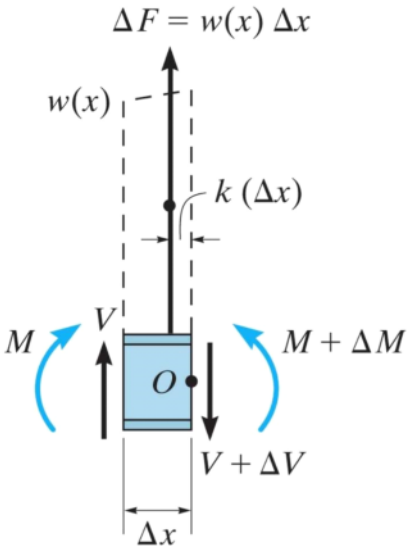
Relations Among Load, Shear and Bending Moments





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:

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

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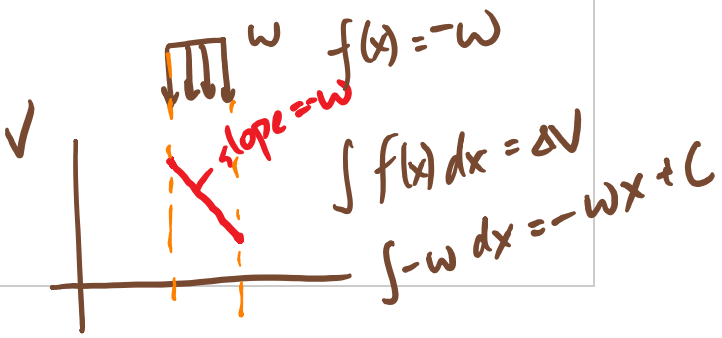

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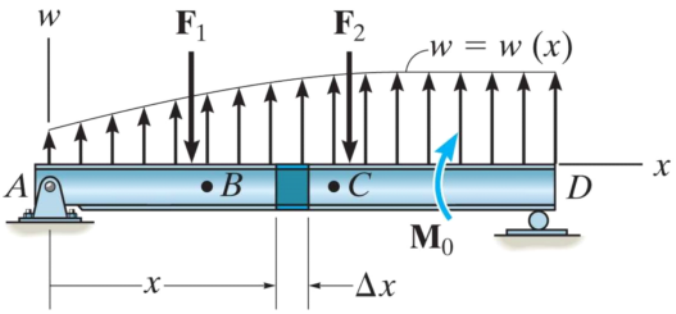
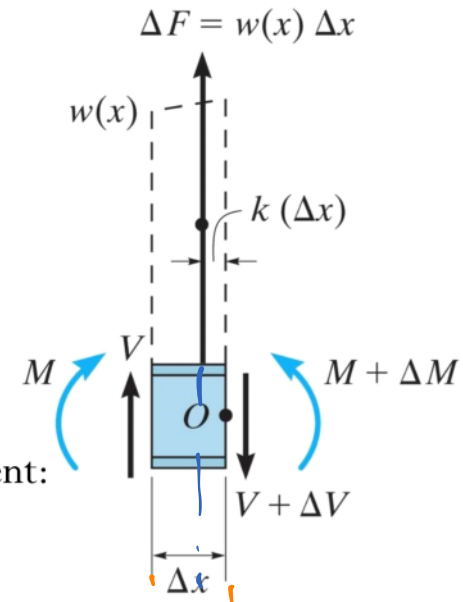
Relations Among Load, Shear and Bending Moments





Relationship between shear and bending moment:

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

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

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

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

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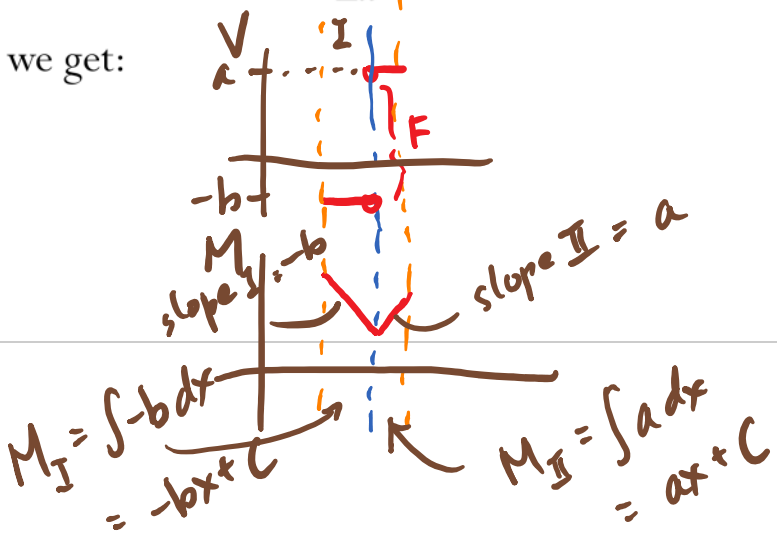

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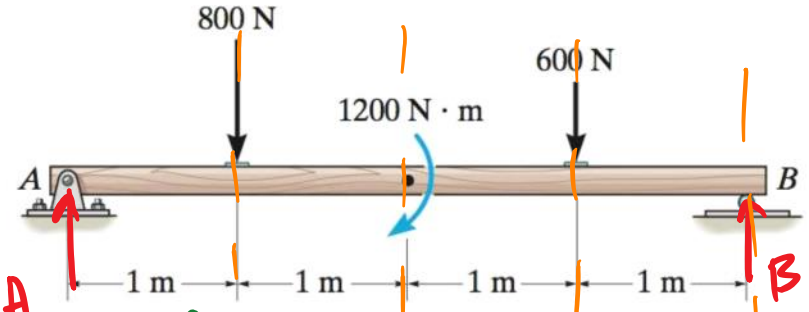
Example

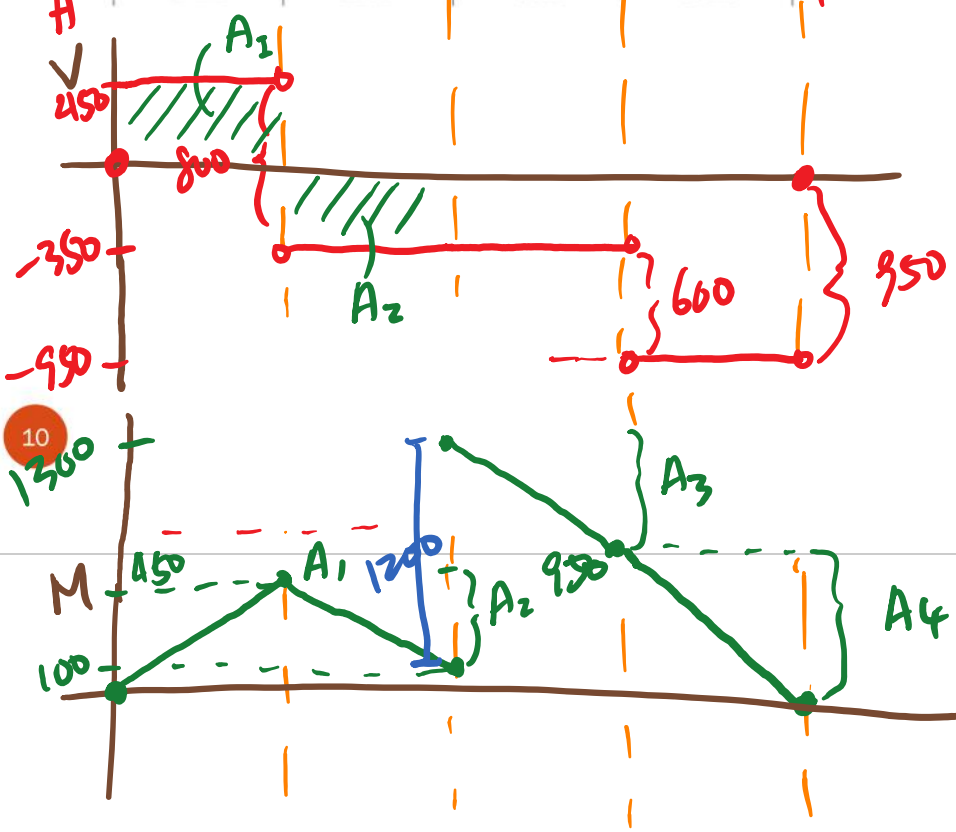
Draw the shear and moment diagrams for the beam.



$\Sigma M_A = [800(1) - 1200 - 6(3) + 4B]\,N\cdot m = 0$

$B = \frac{3800}{4}\,N = 950\,N$

$A = 450\,N$



$A_1 = (450\,N)(1\,m) = 450\,N\cdot m$

$A_2 = -350(1)\,N\cdot m = -350\,N\cdot m$

$A_3 = -350(1)\,N\cdot m = 350\,N\cdot m$

$A_4 = -950(1)\,N\cdot m = -950\,N\cdot m$

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Example

Draw the shear and bending moment diagram for the beam below.