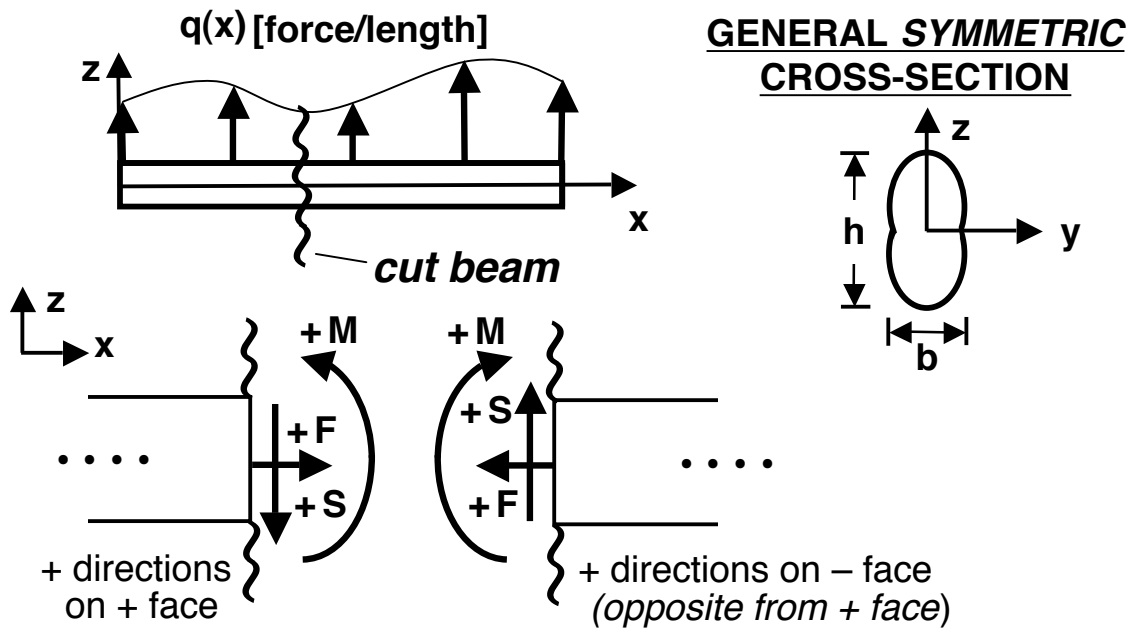


# Unified HANDOUT #M-12

## Spring, 2009

### Summary of Simple Beam Theory



#### PERTINENT EQUATIONS

b = width  
h = height

q(x) = loading  
F(x) = axial load resultant (= 0 for pure beam case)  
S(x) = shear resultant  
M(x) = moment resultant

$$\frac{dS}{dx} = q(x) \quad \text{or} \quad S = \int q(x) dx \quad (1)$$

$$\frac{dM}{dx} = S(x) \quad \text{or} \quad M = \int S(x) dx \quad (2)$$

$$\sigma_{xx} = -\frac{Mz}{I} \quad (3)$$

$$\text{Moment of Inertia} = I = \int z^2 b(z) dz$$

$$\sigma_{xz} = -\frac{SQ}{Ib} \quad (4)$$

$$\text{Moment of Area} = Q(z) = \int_z^{z_{top}} z' b(z') dz'$$

$$M = E_x I \frac{d^2 w}{dx^2} \quad (5)$$