Quiz 8 – 1:30 class - SOLUTION

Q1 – We use the following equation in our beam deflection calculations with the integration method:

$$\theta(x) = \theta(x_0) + \frac{1}{EI}\int_{x_0}^{x} M(x)dx$$

What are the origins of this equation? This equation originates from the Euler-Bernoulli hypothesis that plane sections on the beam cross-section remain plane and perpendicular to the neutral plane: $M = EI/\rho$.

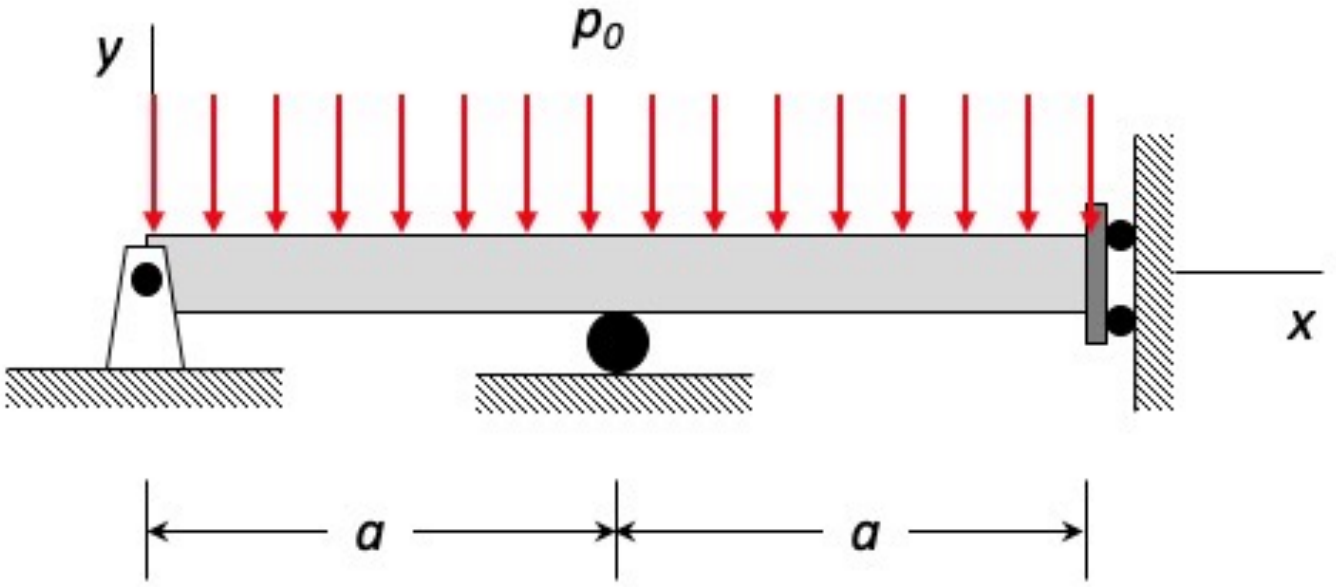
For small rotations of the beam: $\frac{1}{\rho} \approx \frac{d^2v}{dx^2} = \frac{d\theta}{dx}$.

Q2 – We also use the following equation in our beam deflection calculations with the integration method:

$$v(x) = v(x_0) + \int_{x_0}^{x} \theta(x)dx$$

What are the origins of this equation? This equation originates from fundamental calculus for the derivative of a function in terms of single independent variable: $\theta \approx tan\theta = \frac{dv}{dx}$.

Q3 – Consider the beam shown below:



$v(0) = 0$; *zero displacement at left end*
$M(0) = 0$; *no applied/reactive couple at left end*

$v(a) = 0$; *zero displacement at roller*

$V(2a) = 0$; *no applied or reactivve force at right end*
$\theta(2a) = 0$; *zero rotation at right end*