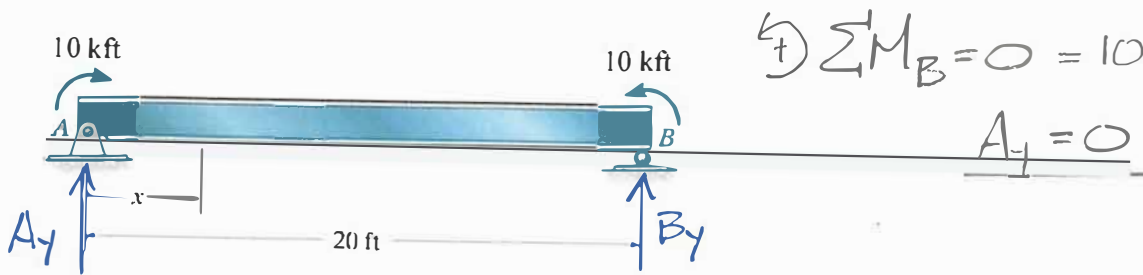


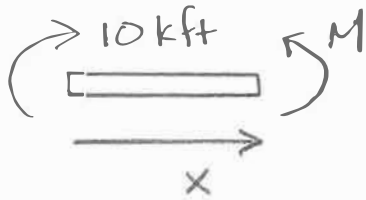
Write the virtual work expression for the displacement at $x = 10$ ft. Assume EI is constant.



$$\sum M_B = 0 = 10 \text{ kft} - 10 \text{ kft} - A_y (20')$$

$$A_y = 0$$

REAL MOMENT $0 \leq x \leq 20$

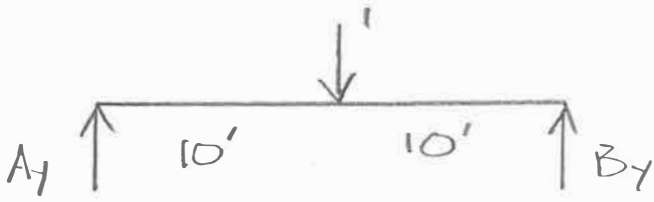


$$\sum M_{cut} = 0 = M - 10 \text{ kft} \quad \underline{\underline{M = 10 \text{ kft}}}$$

VIRTUAL MOMENT

$$\sum M_B = 0 = 1(10') - A_y(20')$$

$$A_y = 1/2$$



$$\sum F_y = 0 = A_y + B_y - 1 \quad \underline{\underline{B_y = 1/2}}$$

$0 \leq x \leq 10$

Free body diagram of a beam segment of length x from A to a cut. A reaction of $1/2$ is applied at A and a moment m_1 is applied at the cut.

$$\sum M_{cut} = 0 = m_1 - 1/2(x)$$

$$\underline{\underline{m_1 = \frac{x}{2}}}$$

$10 \leq x \leq 20$

Free body diagram of a beam segment of length $(20-x)$ from a cut to B. A reaction of $1/2$ is applied at B and a moment m_2 is applied at the cut.

$$\sum M_{cut} = 0 = -m_2 + 1/2(20-x)$$

$$\underline{\underline{m_2 = \frac{1}{2}(20-x)}}$$

$$\delta(x=10) = \frac{1}{EI} \left[\int_0^{10} 10 \left(\frac{x}{2} \right) dx + \int_{10}^{20} 10 \left(\frac{1}{2} \right) (20-x) dx \right]$$