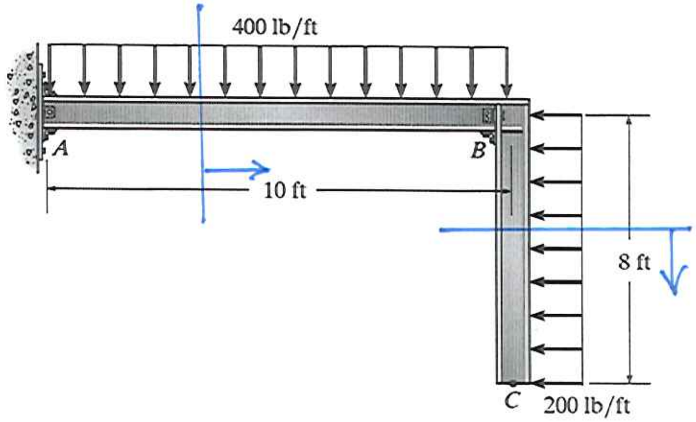
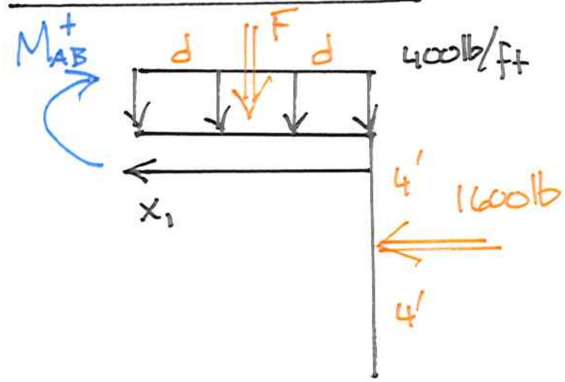
Example 8c-2: Determine the horizontal displacement at point C. Assume EI is constant.



REAL MOMENT AB

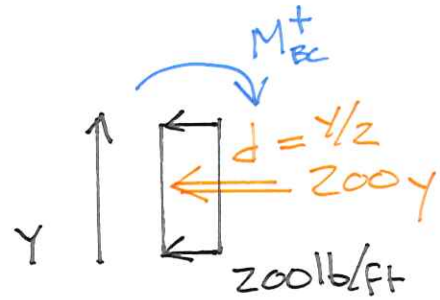


$F = 400x_1 \qquad d = \frac{x_1}{2}$

$\circlearrowleft^{+} \sum M_{CUT} = 0 = -M - 400x_1\left(\frac{x_1}{2}\right)$
$- 1600\text{lb}(4')$

$\underline{M = \left[-200x_1^2 - 6400\right] \text{lb ft}}$

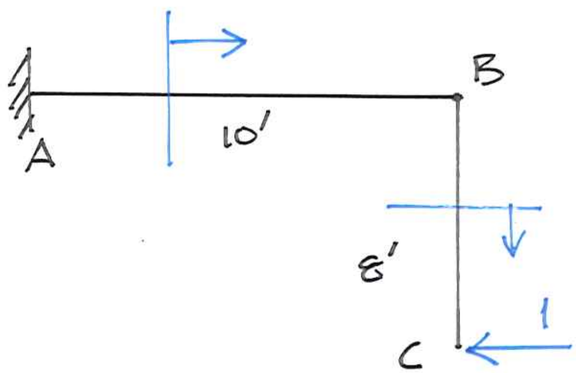
MOMENT BC



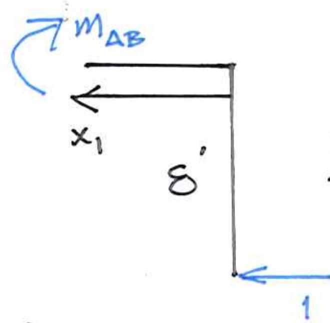
$\circlearrowleft^{+} \sum M_{CUT} = 0 = -M - 200y\left(\frac{y}{2}\right)$

$\underline{M = -100y^2 \text{ lb}\cdot\text{ft}}$

VIRTUAL SYSTEM



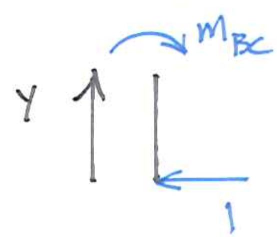
VIRTUAL MOMENT AB



$\underline{m_{AB} = -8 \text{ ft}}$

$\circlearrowleft^{+} \sum M = 0 = -m_{AB} - 1(8')$

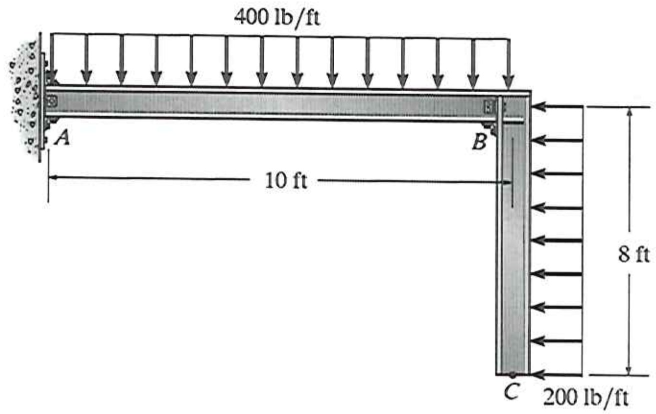
VIRTUAL MOMENT BC



$\circlearrowleft^{+} \sum M_{CUT} = 0 = -m_{BC} - 1Y$

$\underline{m_{BC} = -Y}$

Example 8c-2: Determine the horizontal displacement at point C. Assume EI is constant.



$$\Delta_{H_C} = \int_0^{10} \frac{M_{AB}\, m_{AB}}{EI}\, dx_1 + \int_0^{8} \frac{M_{BC}\, m_{BC}}{EI}\, dy$$

$$= \left[\frac{1}{EI} \int_0^{10} (-200x_1^2 - 6400)(-8)\, dx_1 + \frac{1}{EI} \int_0^{8} (-100y^2)(-y)\, dy \right] \checkmark$$

$$\Delta_{H_C} = \frac{1}{EI} \left[\frac{1600x_1^3}{3} + 51{,}200x_1 \right]_0^{10} + \frac{1}{EI} \left[25y^4 \right]_0^{8}$$

$$= \frac{1}{EI} \left[\frac{3{,}136{,}000}{3} + \frac{307{,}200}{3} \right] = \frac{1{,}147{,}733.33 \text{ lb ft}^3}{EI}$$

$$E = 29{,}000{,}000 \text{ psi}$$

$$I = 1{,}000 \text{ in}^4$$

$$1{,}728 \text{ in}^3/\text{ft}^3$$

$$= \underline{\underline{0.068 \text{ in}}}$$