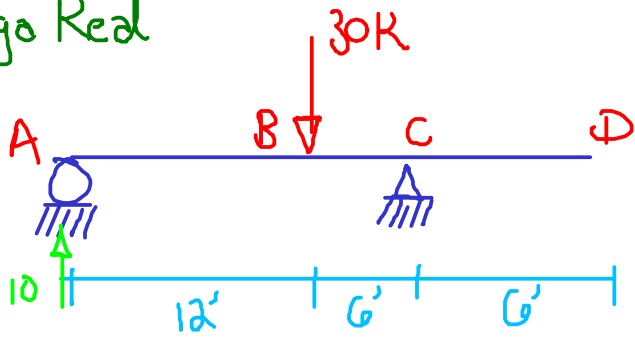


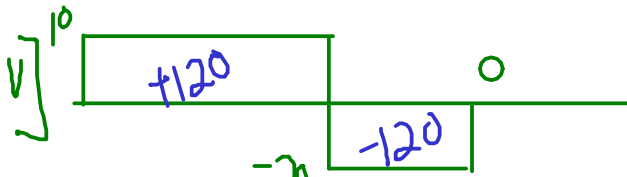
# Viga Real



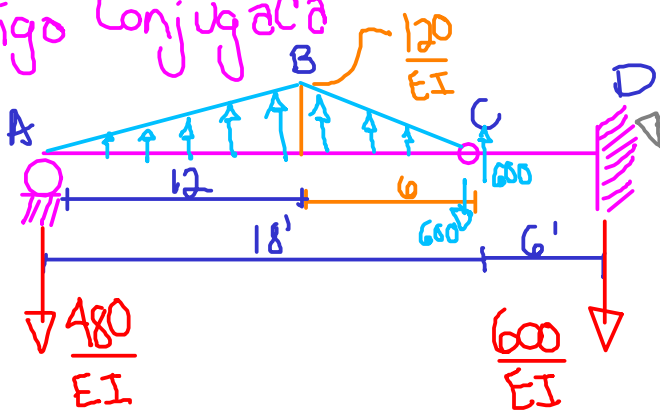
¿  $\delta_{max}$ ?  
&  
¿  $\delta_D$ ?

$$\sum M_C = 30(6) - A_y(18) = 0 \rightarrow A_y = 10K \uparrow$$

$$\sum F_y = 10 - 30 + C_y = 0 \rightarrow C_y = 20K \uparrow$$



# Viga Conjugada



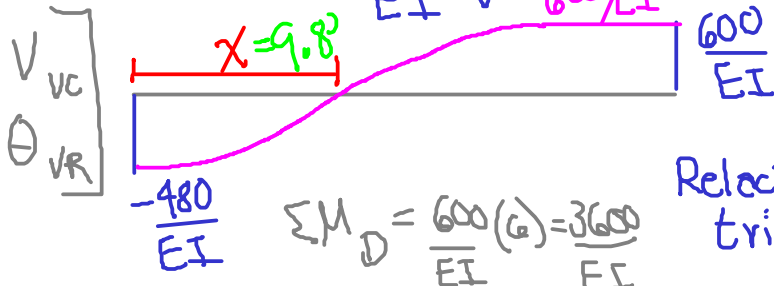
Trapa Izq.

$$\sum M_C = \frac{1}{2}(6)\left(\frac{120}{EI}\right)\left(\frac{2}{3} \cdot 6\right) + \frac{1}{2}(12)\left(\frac{120}{EI}\right)\left(6 + \frac{1}{3} \cdot 12\right) - A_y(18) = 0$$

$$A_y = \frac{480}{EI} \downarrow$$

$$\sum F_y = -\frac{480}{EI} + \frac{1}{2}(18)\left(\frac{120}{EI}\right) - D_y = 0$$

$$D_y = \frac{600}{EI} \downarrow$$



$$\sum M_D = \frac{600}{EI}(6) = \frac{3600}{EI}$$

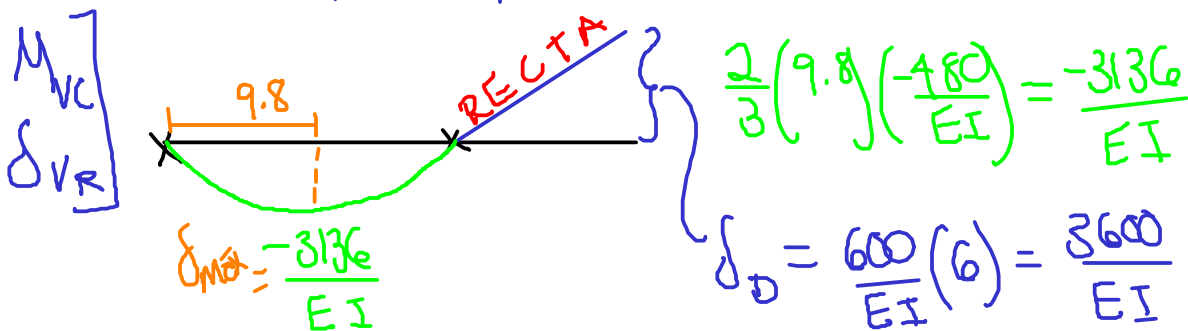
Relacion de triángulos  $\left\{ \begin{array}{l} \frac{x}{12} = \frac{y}{\frac{120}{EI}} \end{array} \right.$

$$y = \frac{10x}{EI}$$

$$\frac{1}{2}xy = \frac{480}{EI} \quad \alpha$$

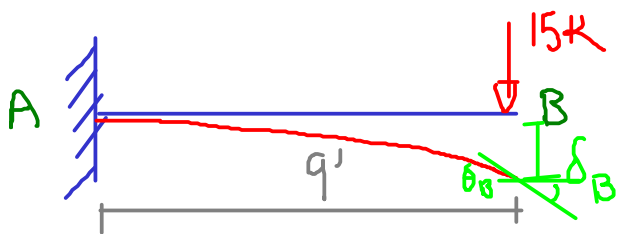
Justituyendo en  $\alpha$

$$\frac{1}{2} \times \left( \frac{10x}{EI} \right) = \frac{480}{EI} \rightarrow x = \underline{9.8 \text{ ft}}$$

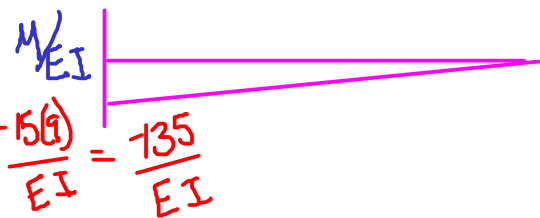


El diagrama de cortantes de la viga conjugada representa las rotaciones de la viga real.

El diagrama de momentos de la viga conjugada representa las deflexiones de la viga real.

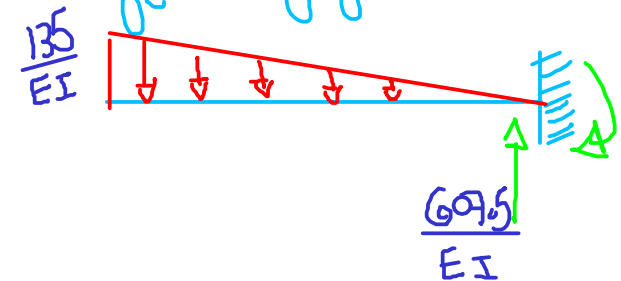


¿  $\delta_B, \theta_B$  ?



Viga Conjugada

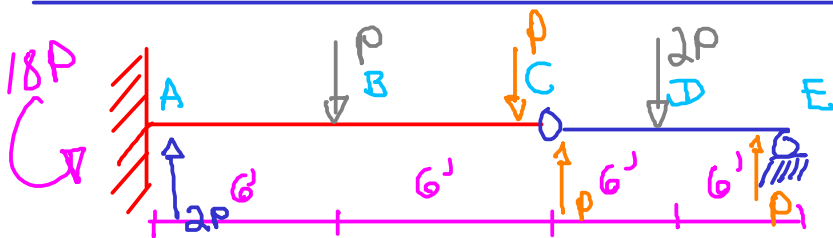
Curvatura negativa



$$\theta_B = \theta_{BVR} = \frac{1}{2} (9) \left( \frac{135}{EI} \right) = \frac{607.5}{EI}$$

$$\sum M_B = M_B - \frac{1}{2} (9) \left( \frac{135}{EI} \right) \left( \frac{2}{3} \cdot 9 \right) = 0$$

$$M_B = -\frac{3645}{EI} = \delta_{BVR}$$

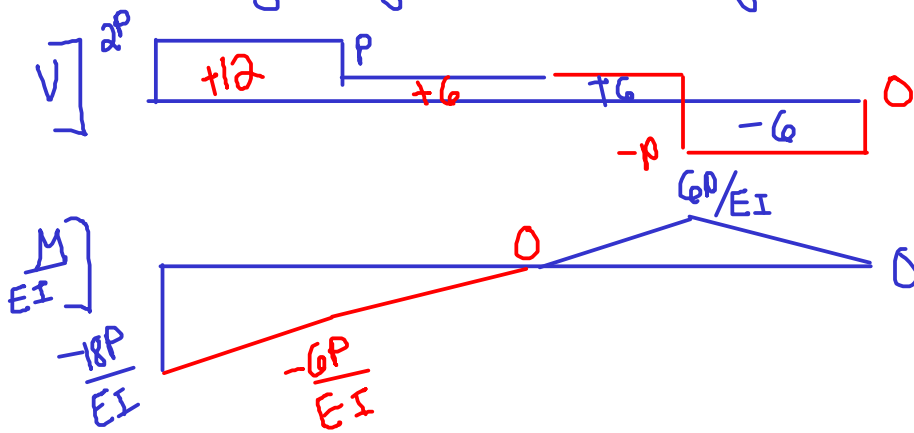


¿  $\delta_{max}, \theta_{max}$  ?

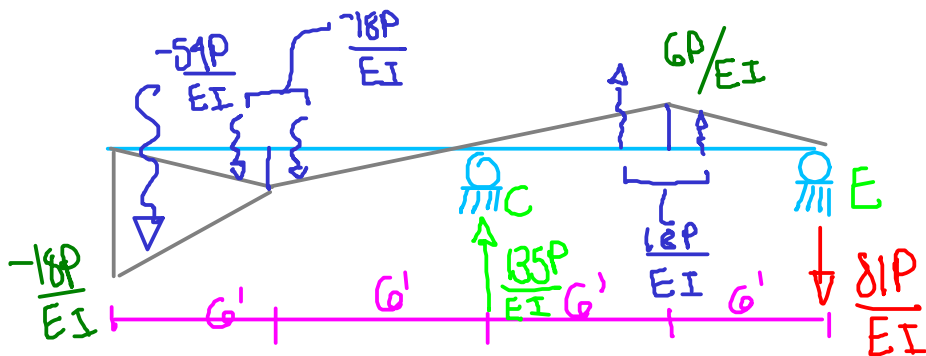
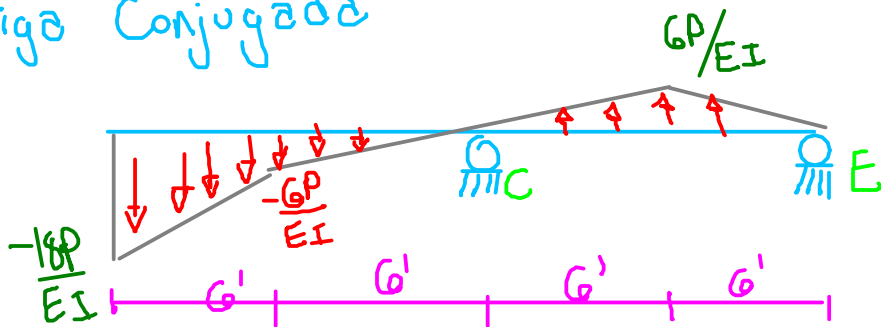
CL I<sub>z</sub>g.

$$\sum M_A = M_A - P(6) - P(12) = 0 \rightarrow M_A = 18P$$

$$\sum F_y = A_y - P - P = 0 \rightarrow A_y = 2P$$



Viga Conjugada

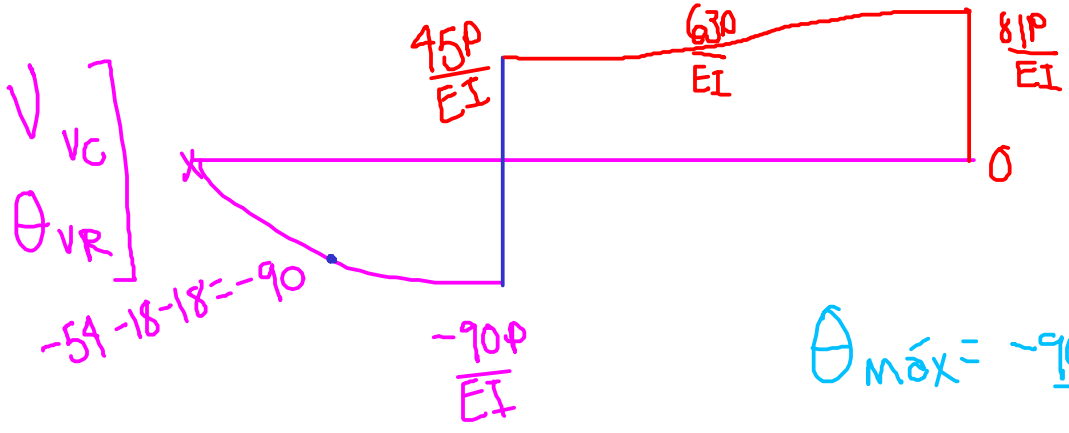


$$\begin{aligned} \sum M_C &= \frac{54P}{EI} \left( 6 + \frac{2}{3} \cdot 6 \right) + \frac{18P}{EI} \left( 6 + \frac{1}{3} \cdot 6 \right) + \frac{18P}{EI} \left( \frac{2}{3} \cdot 6 \right) \\ &+ \frac{18P}{EI} \left( \frac{2}{3} \cdot 6 \right) + \frac{18P}{EI} \left( 6 + \frac{1}{3} \cdot 6 \right) - E_y(12) = 0 \end{aligned}$$

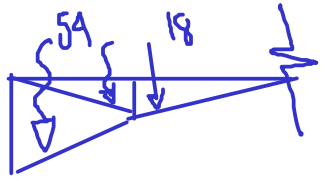
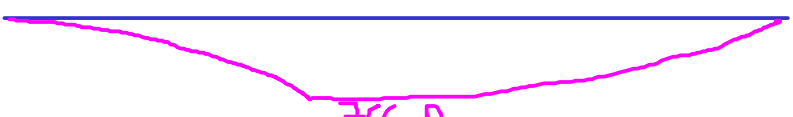
$$E_y = \frac{81P}{EI}$$

$$\sum F_y = \frac{P}{EI} (-54 - 18 - 18 + 18 + 18 - 81 + C_y) = 0$$

$$C_y = \frac{135P}{EI}$$



$M$   
 $\delta_{VR}$



$$M = 59\left(6 + \frac{2}{3} \cdot 6\right) + 18\left(6 + \frac{1}{3} \cdot 6\right) + 18\left(\frac{2}{3} \cdot 6\right)$$

$$= \frac{756P}{EI}$$