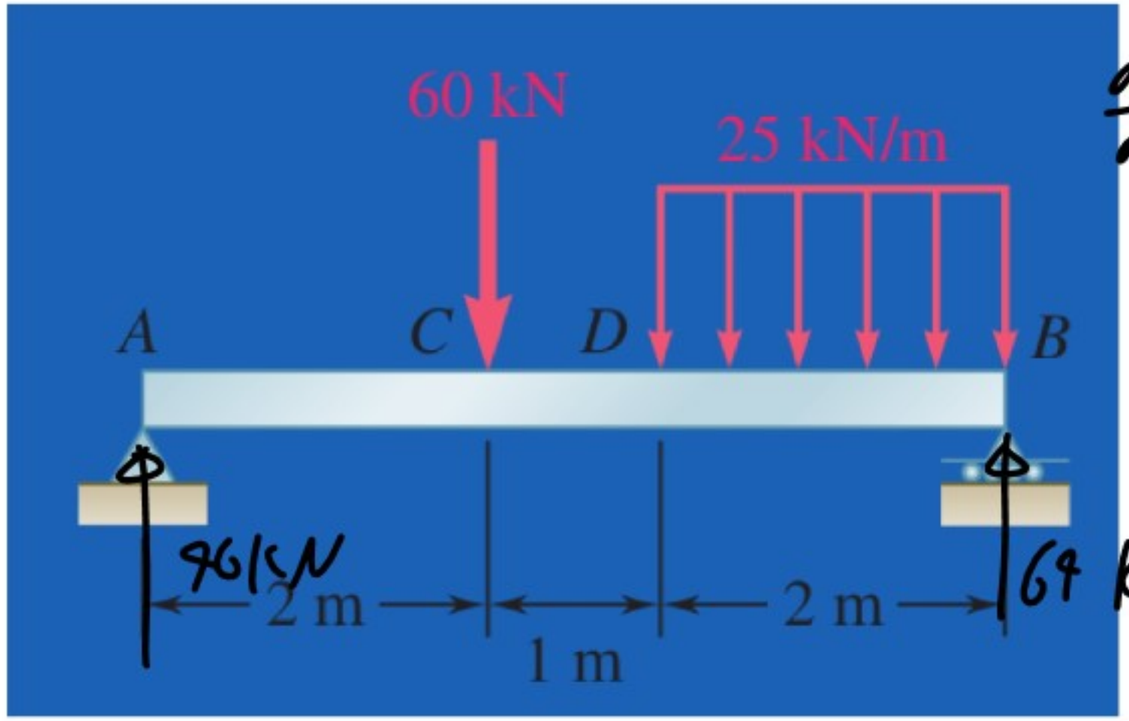
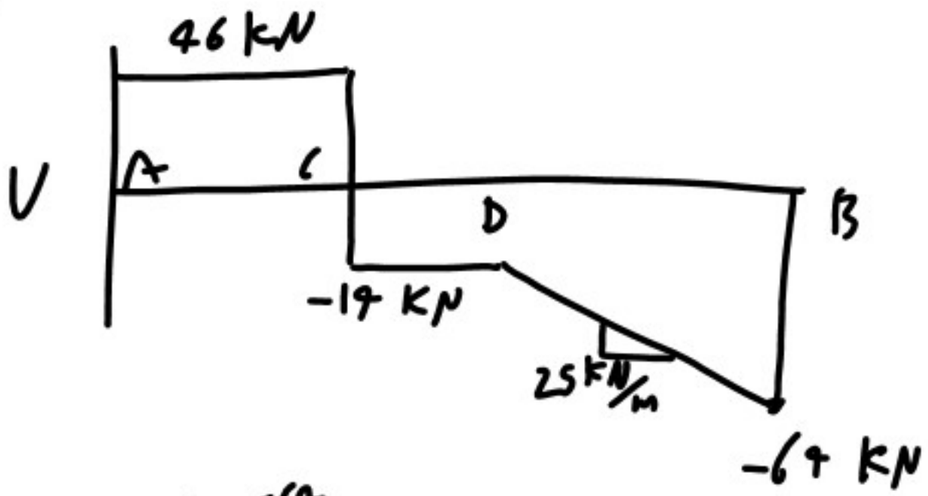
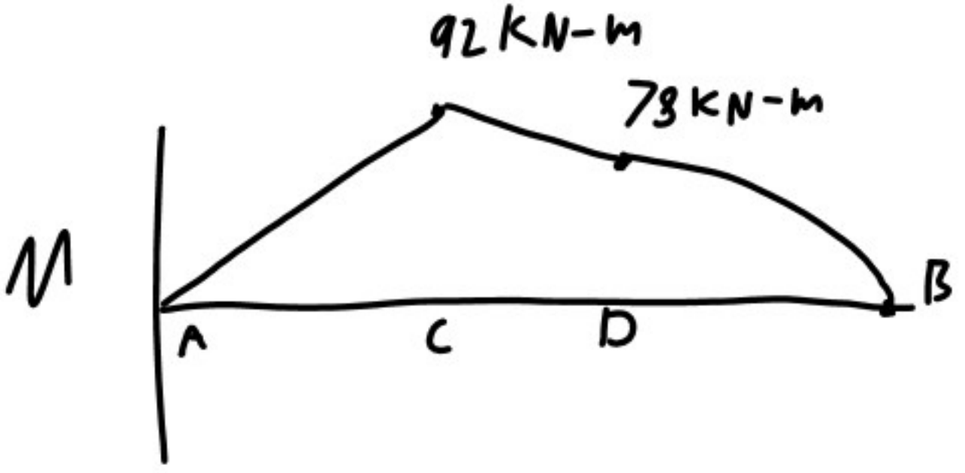


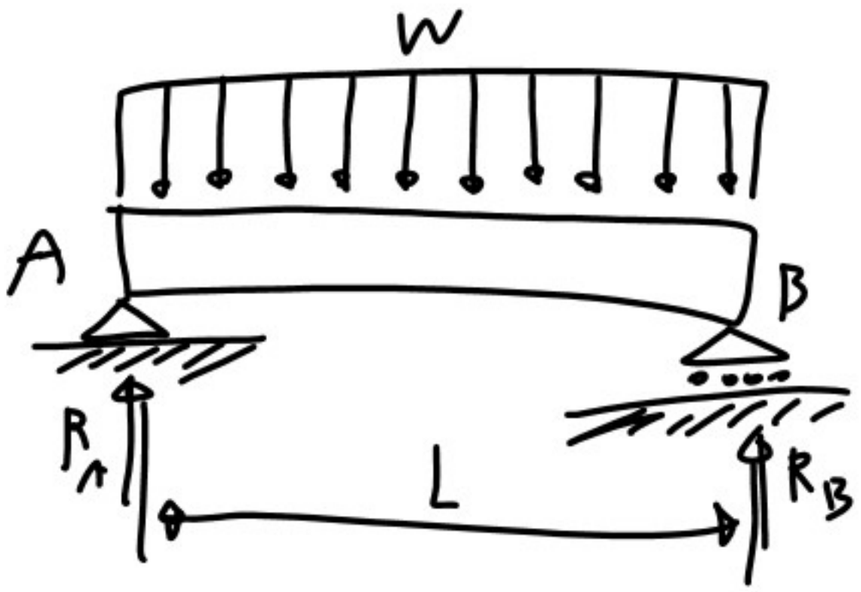

$$\frac{dV}{dx} = w$$




$-25 \cdot 2 - 19 = -69$

$$\frac{dM}{dx} = V$$






$$\frac{dV}{dx} = -w$$

$$\frac{dM}{dx} = V$$

$\Sigma M_A = 0$

$L R_B - \frac{L}{2} L w = 0$

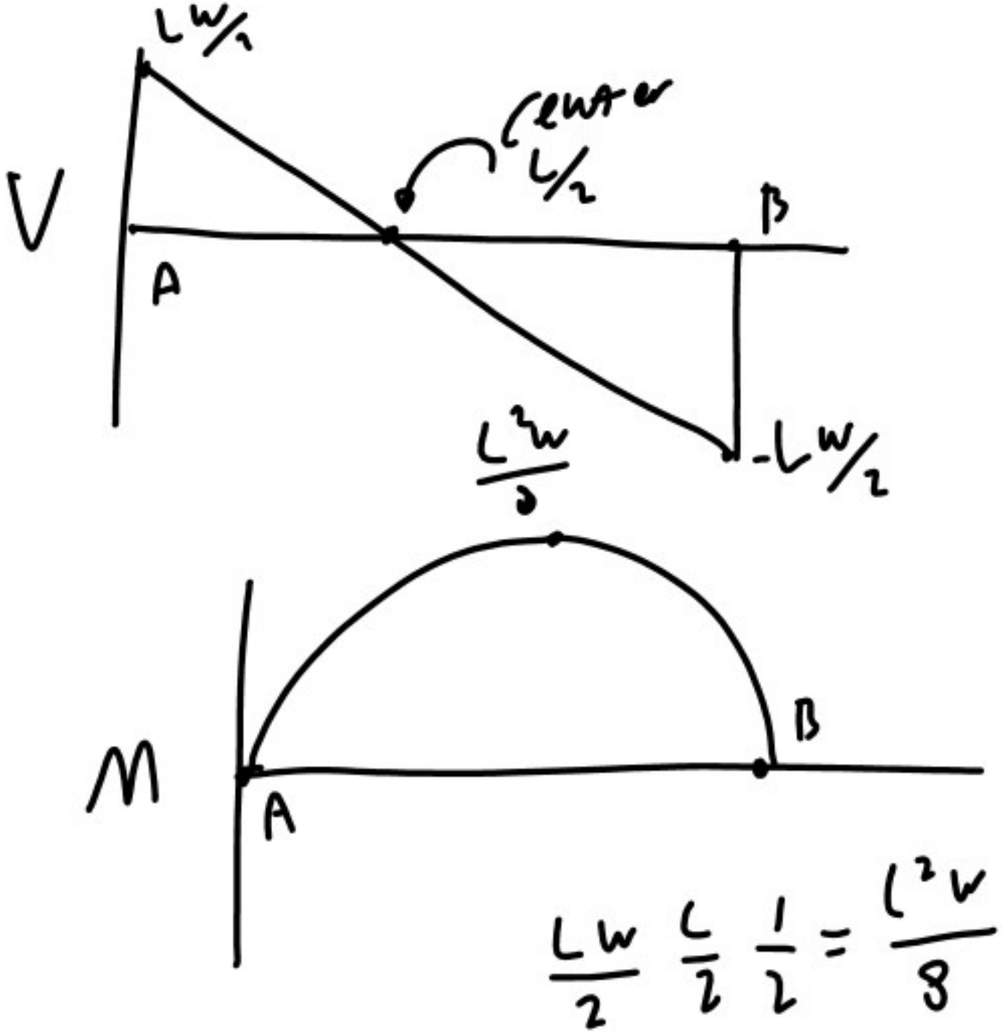
$L R_B = \frac{L^2 w}{2}$ $\quad R_B = \frac{Lw}{2}$

$\Sigma F_y = 0$

$R_A + R_B - Lw = 0$

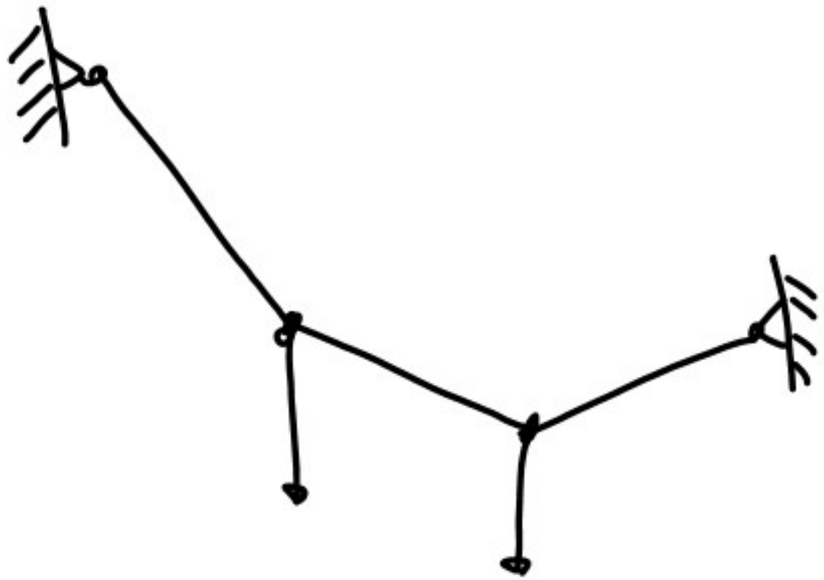
$R_A = Lw - R_B = Lw - \frac{Lw}{2}$

$R_A = \frac{Lw}{2}$




$\frac{Lw}{2} \quad \frac{L}{2} \quad \frac{1}{2} = \frac{L^2 w}{8}$

# Cables



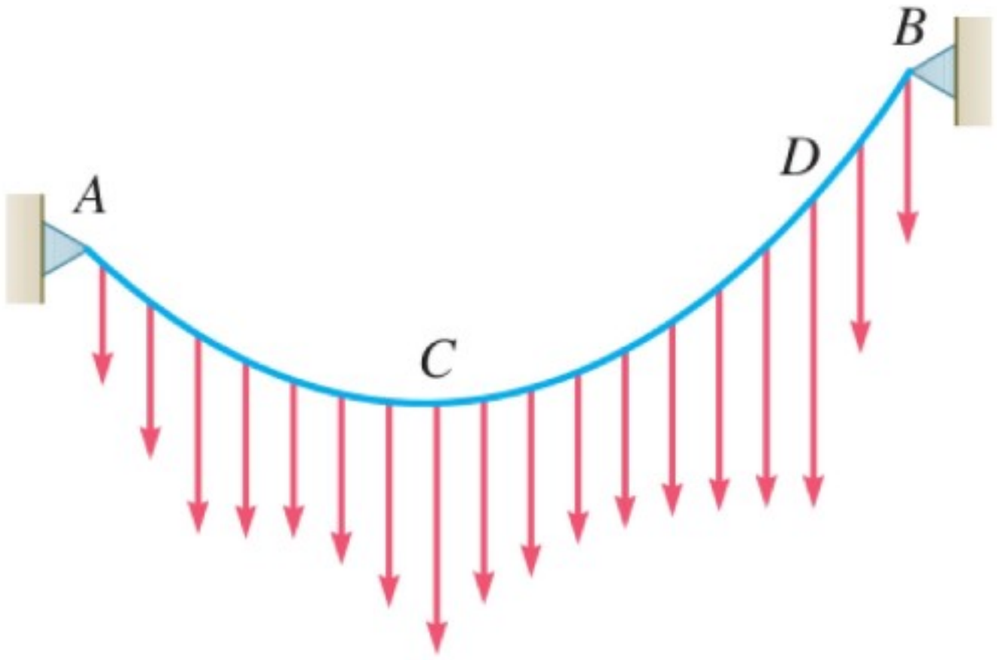
Assume cable massless

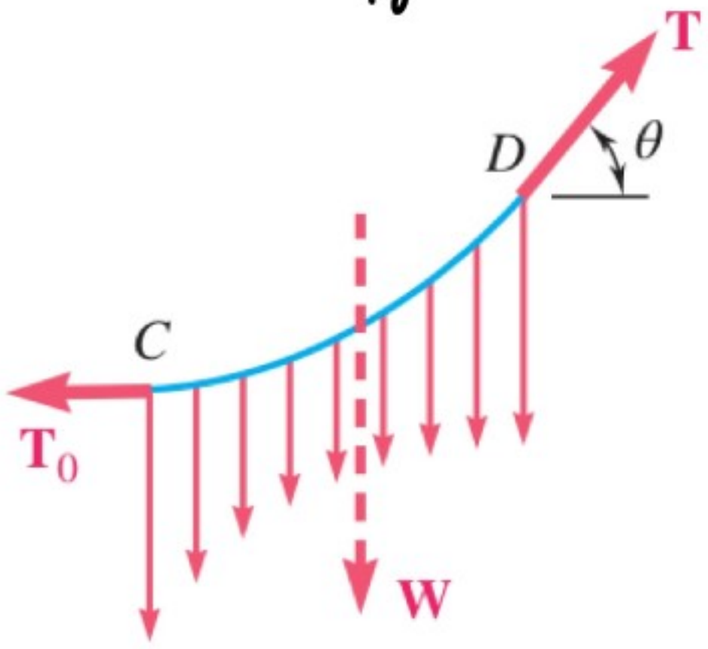
Cable inelastic

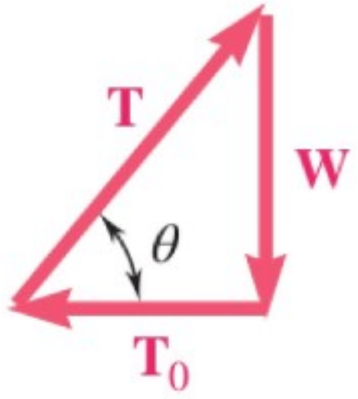
Cable flexible

$T\cos\theta = T_0 \qquad T\sin\theta = W$

$$\tan\theta = \frac{W}{T_0} \qquad T = \sqrt{T_0^2 + W^2}$$



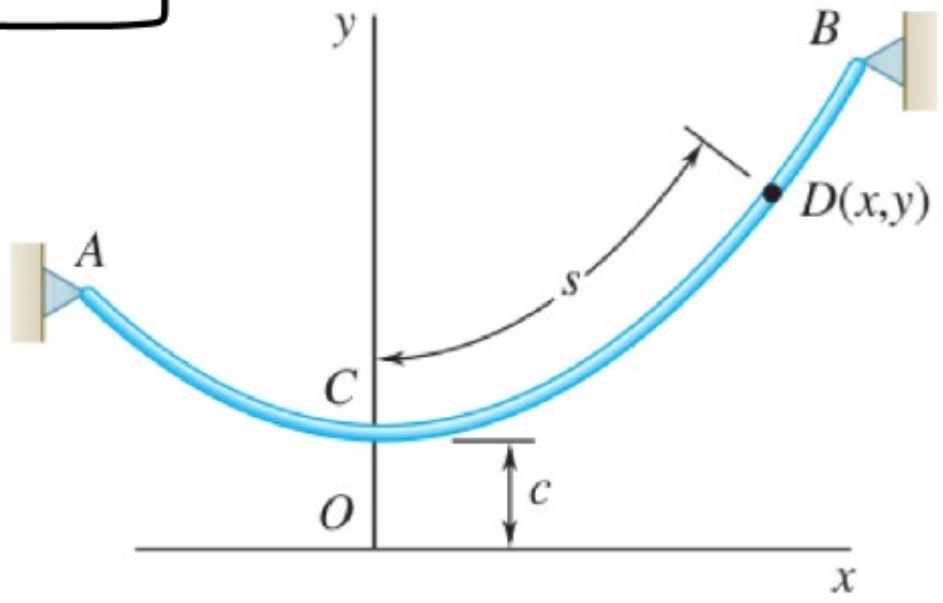



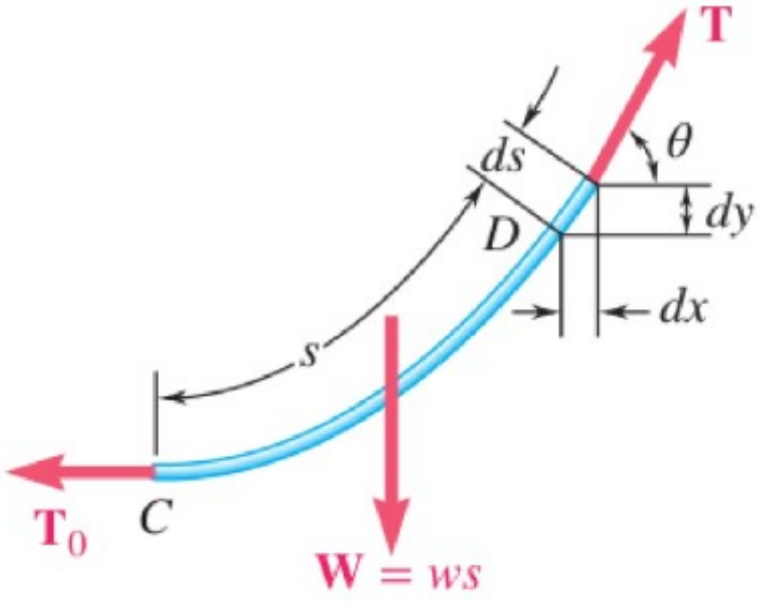



Assume cable has mass

$$c = \frac{T_0}{w}$$

$$T = \sqrt{T_0^2 + w^2 s^2} = \sqrt{c^2 w^2 + w^2 s^2} = w\sqrt{c^2 + s^2}$$

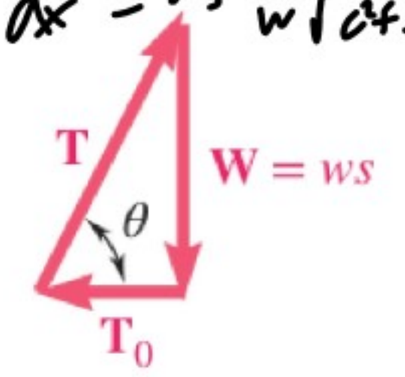



$$dx = ds\cos\theta$$

$$= ds\,\frac{T_0}{T}$$

$$dx = ds\,\frac{wc}{w\sqrt{c^2+s^2}}$$



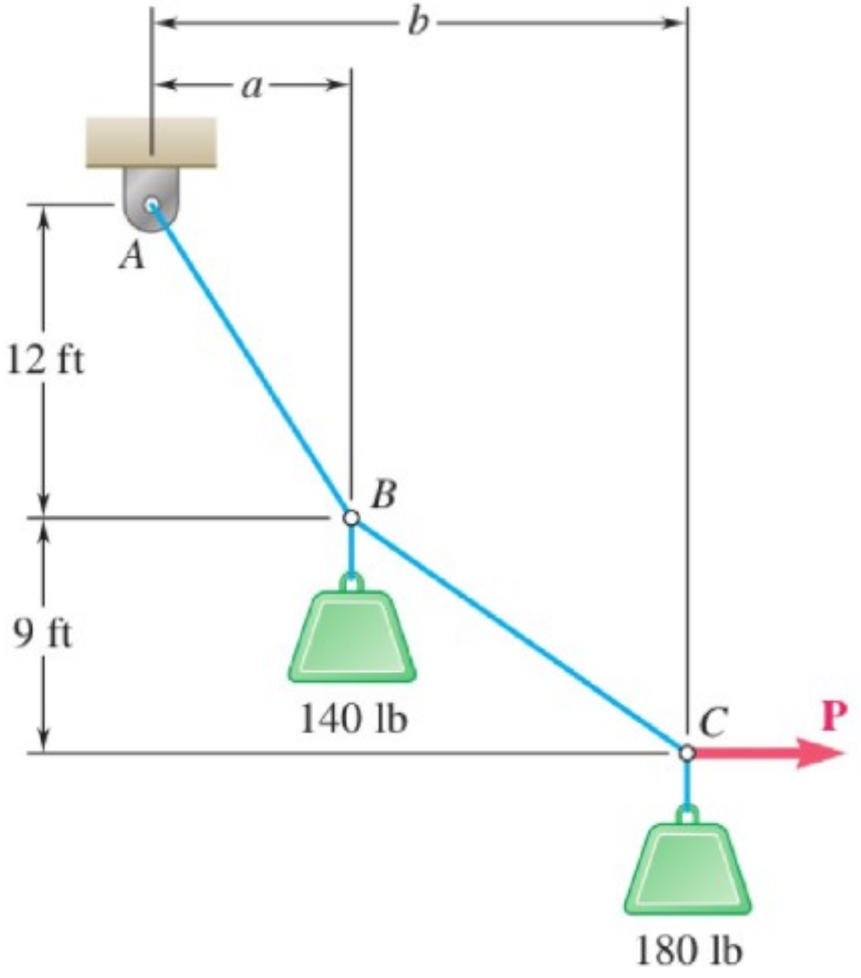
$$\int_0^s dx = \int_0^s \frac{1}{\sqrt{1 + s^2/c^2}}\, ds \quad \Rightarrow \quad s = c \sinh^{-1}\left(\frac{s}{c}\right) \quad \Rightarrow \quad \boxed{s = c\sinh\left(\frac{x}{c}\right)}$$

$$dy = dx \tan\theta = dx \frac{w}{T_0} = dx \frac{ws}{T_0} = dx \frac{s}{c} = dx \frac{c\sinh\left(\frac{x}{c}\right)}{c} = \sinh\left(\frac{x}{c}\right) dx$$

$$y - c = \int_0^x \sinh\left(\frac{x}{c}\right) dx = c\cosh\left(\frac{x}{c}\right) - c \quad \Rightarrow \quad \boxed{y = c\cosh\left(\frac{x}{c}\right)}$$

catenary

**7.103** Cable $ABC$ supports two loads as shown. Knowing that $b = 21$ ft, determine ($a$) the required magnitude of the horizontal force **P**, ($b$) the corresponding distance $a$.



**7.104** Cable $ABC$ supports two loads as shown. Determine the distances $a$ and $b$ when a horizontal force **P** of magnitude 200 lb is applied at $C$.