Quiz 1

Multiple Attempts

2.103 A crate is supported by three cables as shown. Determine the weight W of the crate, knowing that the tension in cable AD is 924 lb.

$\lambda_1 = \sqrt{18^2 + 26^2 + 45^2} = 55$ in

$\lambda_2 = \sqrt{28^2 + 45^2 + 0^2} = 51$

$\lambda_3 = \sqrt{28^2 + 45^2 + 0^2} = 53$

$\vec{\lambda}_1 = \frac{-26}{55} i + \frac{45}{55} j + \frac{18}{55} k$

$\vec{\lambda}_2 = \frac{0}{51} i + \frac{45}{51} j - \frac{28}{51} k$

$\vec{\lambda}_3 = \frac{28}{53} i + \frac{45}{53} j + 0 k$

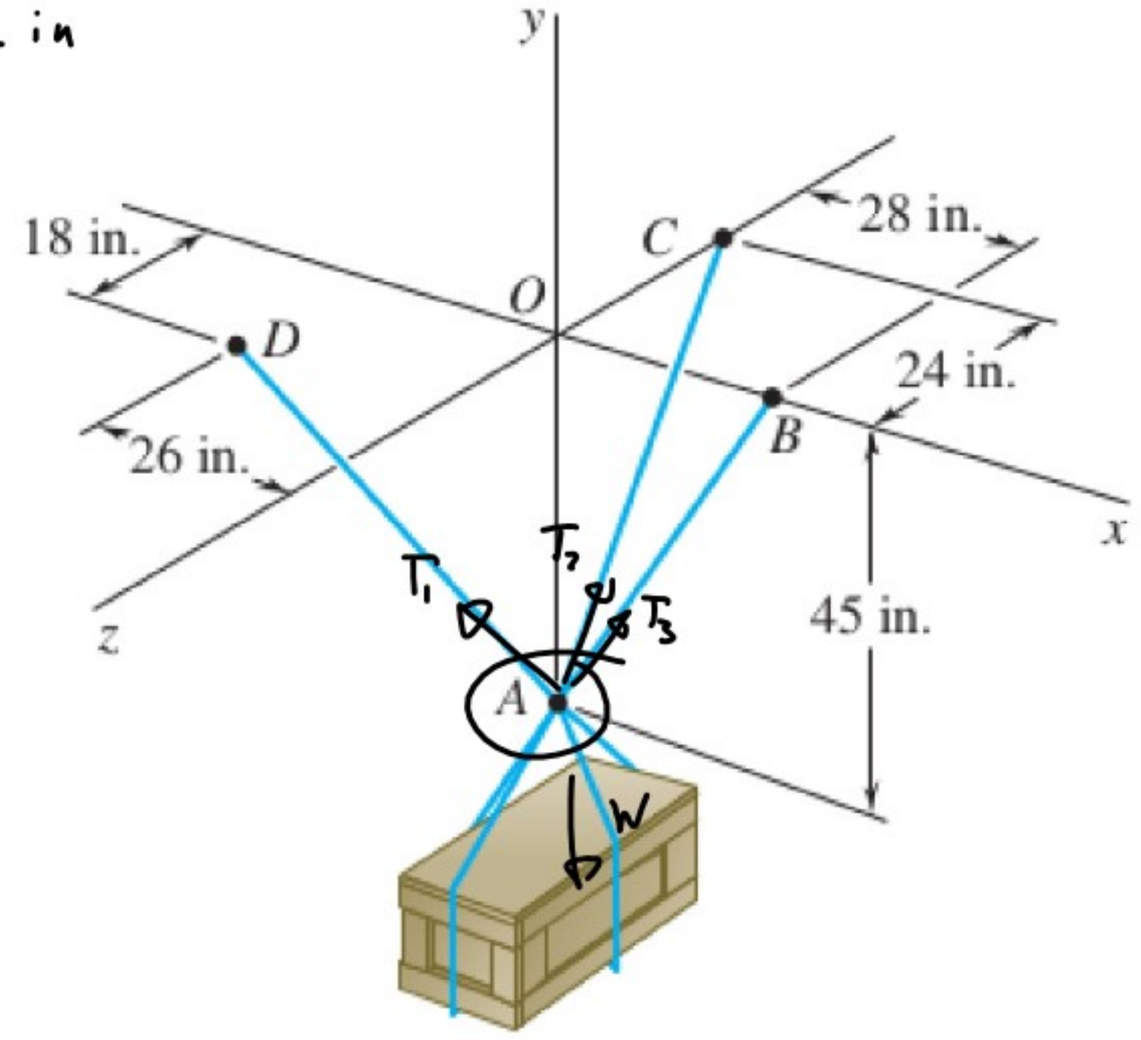


Fig. P2.103 and P2.104

$T_1 = 924$

$\vec{T}_1 = 924 \vec{\lambda}_1$

$T_{1x} + T_{2x} + T_{3x} = W_x$ (0, 0)

$T_{1x} + T_{3x} = 0$

$T_{1z} + T_{2z} + T_{3z} = W_z$ (0, 0)

$\lambda_{3x} = \frac{T_{3x}}{T_3}$

$$\vec{T}_1 = T_1 \vec{\lambda}_1 = T_1\left(\frac{-26}{55}i + \frac{45}{55}j + \frac{18}{55}k\right)$$

$$= -936\,i + 756\,j + 302\,k$$

$$T_{1y} + T_{2y} + T_{3y} = W$$

$$756 + 566 + 700 = \boxed{2023 \text{ lb}}$$

$$T_{3x} = -T_{1x} = 936 \text{ lb}$$

$$\lambda_{3x} = \frac{28}{53} = \frac{T_{3x}}{T_3} = \frac{936}{T_3} \Rightarrow T_3 = \frac{936(53)}{28} = 825 \text{ lb}$$

$$T_{3y} = T_3 \lambda_{3y}$$

$$= 825\,\frac{45}{53} = 700 \text{ lb}$$

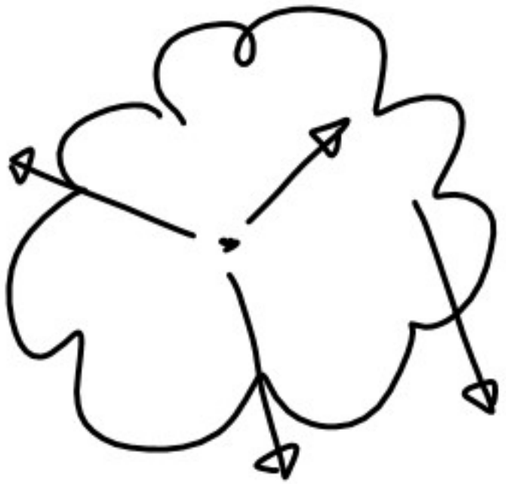
$$T_{2z} = -T_{12} = -302 \text{ lb}$$

$$\lambda_{2z} = -\frac{24}{51} = \frac{T_{2z}}{T_2} \Rightarrow T_2 = \frac{-302(51)}{-24} = 642 \text{ lb}$$

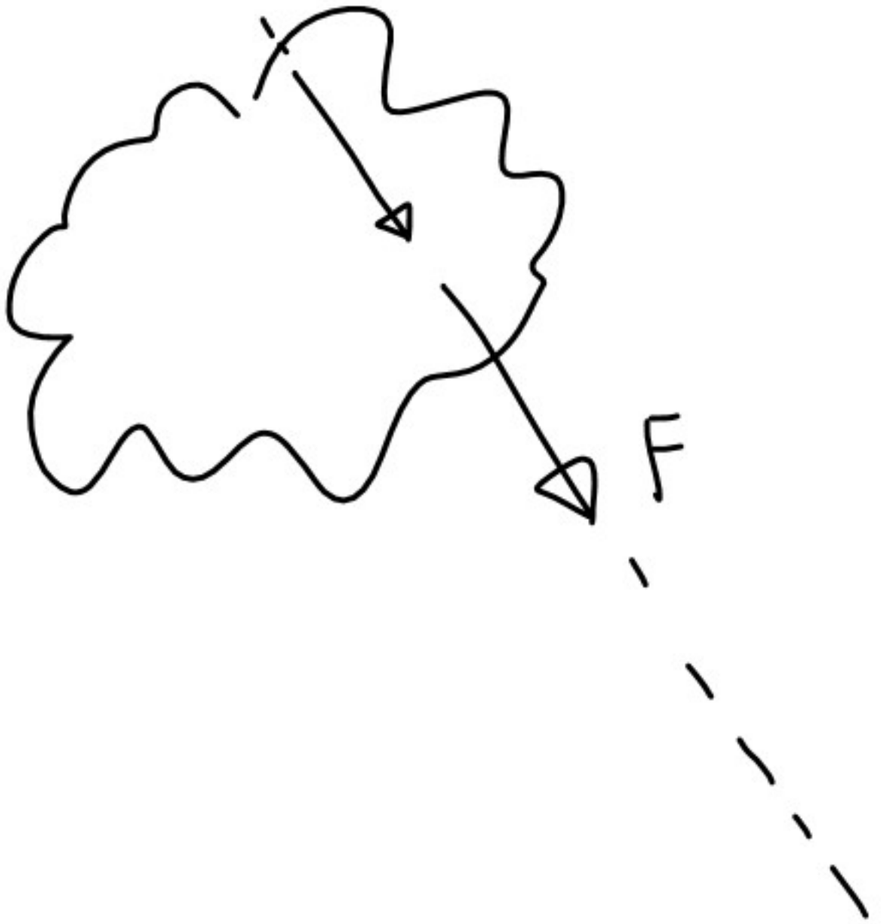
$$T_{2y} = T_2 \lambda_{2y}$$

$$= 642\,\frac{45}{51} = 566 \text{ lb}$$

Rigid Bodies



Transmissability



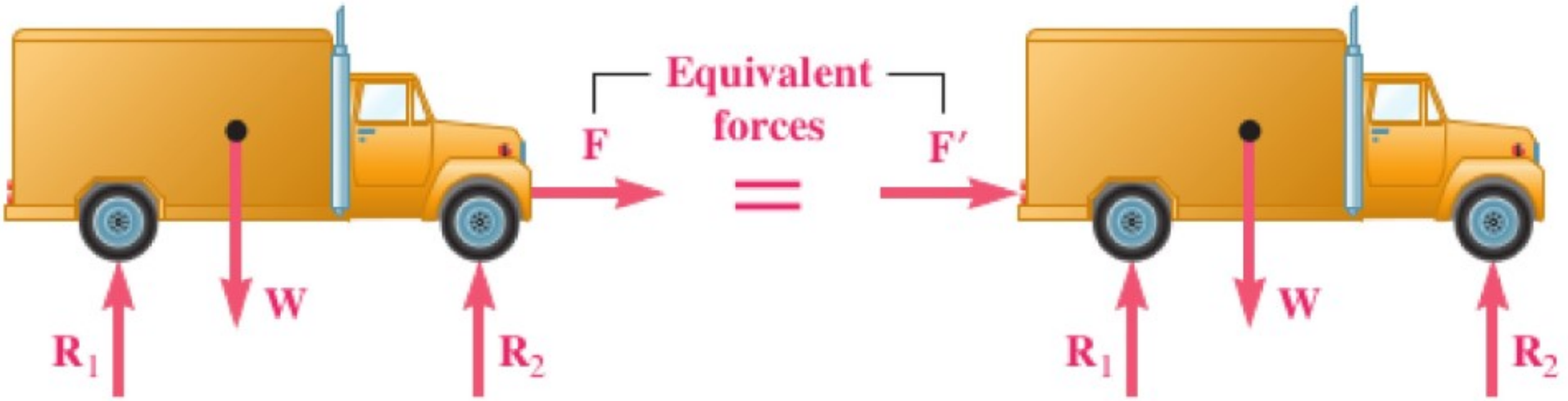


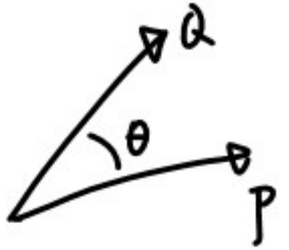
Fig. 3.3 Force **F′** is equivalent to force **F**, so the motion of the truck is the same whether you pull it or push it.

Cross Product

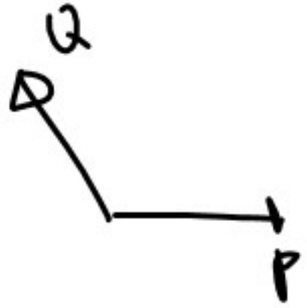
$V = PQ \sin\theta$

$\vec{V} = \vec{P} \times \vec{Q}$

$\vec{V} = \vec{Q} \times \vec{P} = -(\vec{P} \times \vec{Q})$



Right Hand Rule



Out ⊙

In ⊗