

How do we operate with vectors?

A clothesline is tied between two poles, 8 m apart. The line is quite taut and has negligible sag. When a wet shirt with a mass of 0.8 kg is hung at the middle of the line, the midpoint is pulled down 8 cm. Find the tension in each half of the clothesline.

Diagram illustrating the forces on the clothesline midpoint:

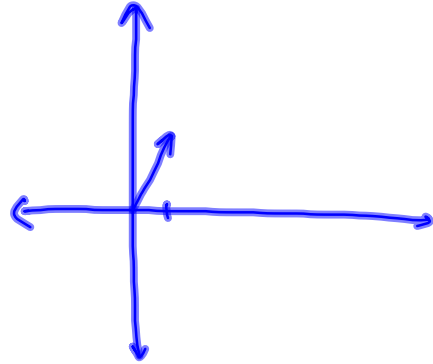
- Distance between poles: 8 m
- Mass of wet shirt: 0.8 kg
- Displacement of midpoint: 0.08 m
- Forces: Tension (T_1 , T_2), Weight (Wt)
- Handwritten equations:
 - $T_1 + T_2 = Wt$
 - $T_1 + T_2 + Wt = 0$
 - $Wt = mg = .8(10) = 8 \text{ N}$
 - $2b = 8 \text{ N}$
 - $b = 4 \text{ N}$
 - $\frac{a}{b} = \frac{4}{.08}$
 - $\frac{a}{4} = \frac{4}{.08} \Rightarrow a = 200 \text{ N}$
 - $T_1 = -200i + 4j$
 - $|T_1| = 4\sqrt{2501}$
 - $= \sqrt{(200)^2 + 4^2}$

Dot product.

$$\langle a, b \rangle \cdot \langle c, d \rangle = ac + bd$$

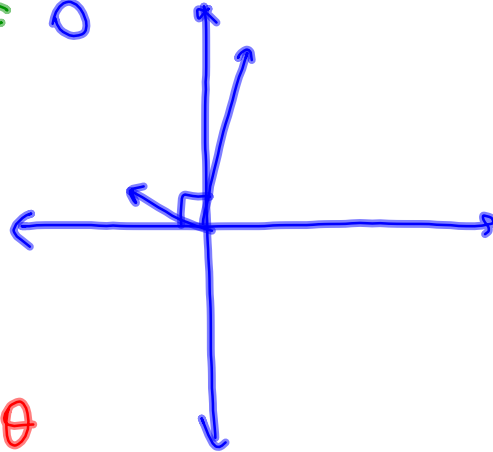
$$1) \langle 1, 2 \rangle \cdot \langle 1, 2 \rangle = 5$$

$$|\langle 1, 2 \rangle| = \sqrt{5} \quad \sqrt{5}$$



$$2) \langle 1, 6 \rangle \cdot \langle -2, \frac{1}{3} \rangle = 0$$

$$\sqrt{37} \quad \sqrt{\frac{37}{9}}$$



$$\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos \theta$$

