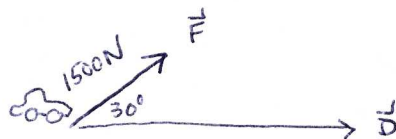


Instructions: All questions are worth 2 points. You get one point for taking this quiz.

1. A car is towed using a force of 1500 Newtons. The cable used to pull the car makes a 30° angle with the horizontal. Find the work done in towing the car 2 kilometers. Your final answer should include units.



The car is towed horizontally through a displacement \vec{D} .

The force from towing is shown.

$$\begin{aligned} W &= \vec{F} \cdot \vec{D} = \|\vec{F}\| \|\vec{D}\| \cos 30^\circ \\ &= (1500 \text{ N})(2 \text{ km}) \frac{\sqrt{3}}{2} \\ &= 1500\sqrt{3} \text{ N km} \quad \text{OR} \quad 1500,000\sqrt{3} \text{ Nm} \end{aligned}$$

2. Determine if the three vectors $\vec{p} = \langle 1, 1, 1 \rangle$, $\vec{q} = \langle 2, 0, -3 \rangle$, and $\vec{r} = \langle -1, 3, 9 \rangle$ are coplanar.

Check if $\vec{p} \cdot (\vec{q} \times \vec{r}) = 0$

$$\vec{q} \times \vec{r} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 0 & -3 \\ -1 & 3 & 9 \end{vmatrix} = (0 - -9)\hat{i} - (18 - 3)\hat{j} + (6 - 0)\hat{k} = 9\hat{i} - 15\hat{j} + 6\hat{k}$$

$$\begin{aligned} \text{Thus, } \vec{p} \cdot (\vec{q} \times \vec{r}) &= \langle 1, 1, 1 \rangle \cdot \langle 9, -15, 6 \rangle \\ &= 9 - 15 + 6 \\ &= 0 \end{aligned}$$

Since the scalar triple product is zero, the vectors are coplanar.