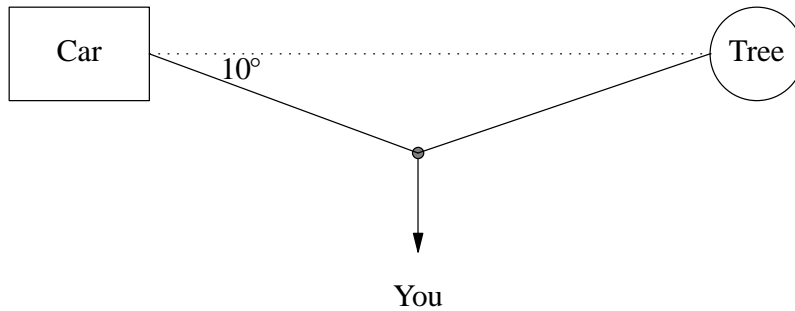
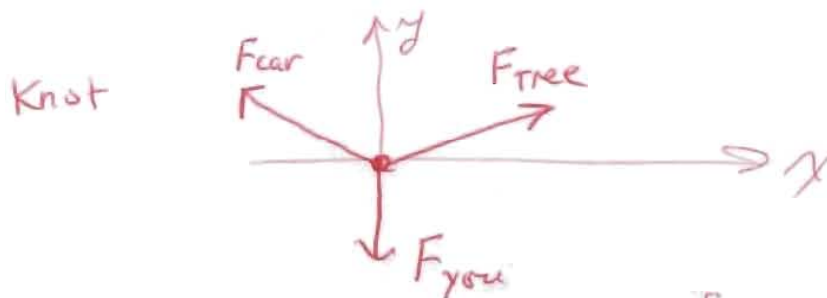
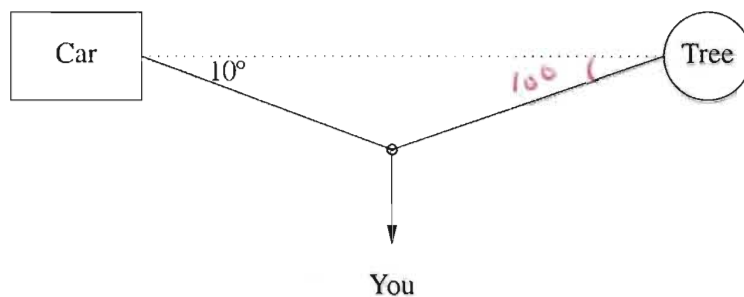


3. (20 pts.) Your car is stuck in the mud near a tree, as shown in the diagram. You attach a rope from the car to the tree as shown, and then pull at the midpoint perpendicular to the rope. The rope is then at an angle of 10° . If you pull with a force of 400 N, what is the force exerted by the rope on the car? (Hint: Construct a free-body diagram for the knot in the rope where you are pulling.)



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[see Example 5-1]

$$\Sigma F_x = 0$$

$$F_{tree} \cos 10^\circ - F_{car} \cos 10^\circ = 0$$

$$F_{tree} = F_{car}$$

$$\Sigma F_y = 0$$

$$F_{tree} \sin 10^\circ + F_{car} \sin 10^\circ - F_{you} = 0$$

$$2 F_{tree} \sin 10^\circ = F_{you}$$

$$F_{car} = F_{tree} = \frac{400 \text{ N}}{2 \sin 10^\circ} = \boxed{1152 \text{ N}}$$