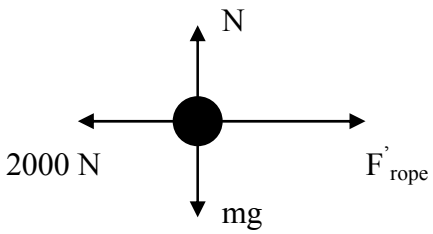
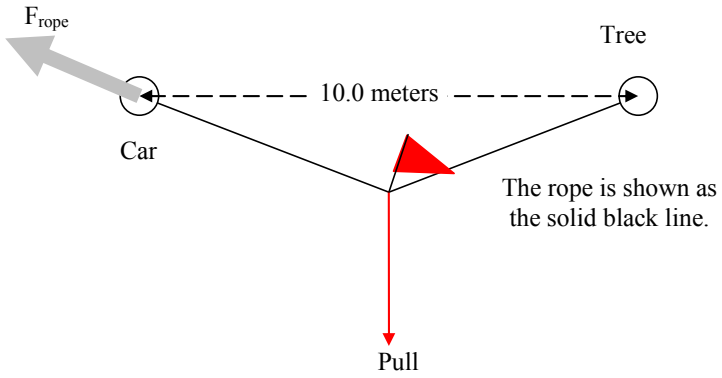
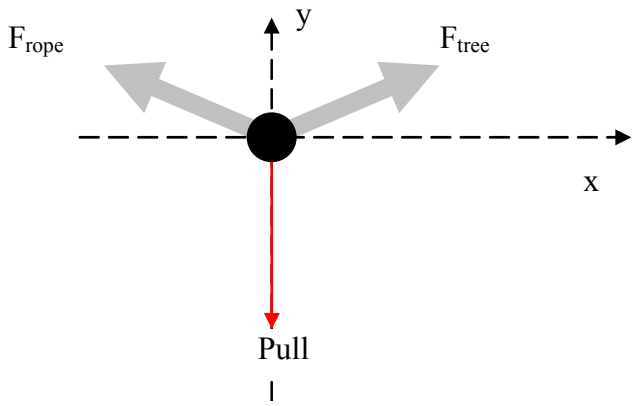
Homework assignment 4
(a) Yes. See the reasoning below.
(b) When you draw freebody diagram for the car, there are total of 4 forces, two in vertical direction and two in horizontal direction. (why?) following is the side view.



(c) When you draw free boby diagram for the middle point of the rope, *e.g.* the flag, don't worry about the gravity, just think it is a question about the balance of 3 forces, similar as the example we discussed in the class. (why is not there any gravity and normal force for the flag?) The following is what we have.



This is the free-body diagram. (from the top view)



(d) Basically, you don't have to do any calculation for the car. Just calculate the force in the rope between the car and the flag, starting from the freebody diagram in your part (c) as following:

	x direction	y direction
F_{rope}	$-F_{rope}\cos(11.36^o)$	$F_{rope}\sin(11.36^o)$
F_{tree}	$+F_{tree}\cos(11.36^o)$	$F_{tree}\sin(11.36^o)$
F_{pull}	0	-800 N

(How did we get 11.36º? That's from the trigonometry by using cos(angle)=5.0 m/5.1 m)
We know that the flag is in the balance position, which means:
$\sum F_x=0$. e.g. $-F_{rope}\cos(11.36^o)+F_{tree}\cos(11.36^o)=0$, which gives you $F_{rope}=F_{tree}$

$\sum F_x=0$. e.g. $+F_{rope}\sin(11.36^o)+F_{tree}\sin(11.36^o)-800\text{ N}=0$,
Plug in $F_{rope}=F_{tree}$, we have $2F_{rope}\sin(11.36^o)-800\text{ N}=0$,
Solve for F_{rope}, you have: $F_{rope}=2031$ N. >2000 N

(Note that the F'_{rope} in the free body diagram for the car and F_{rope} in the free body diagram for the flag are a pair of action and reaction. They have same magnitudes but opposite directions.)