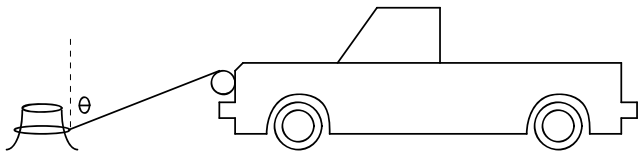
Due date: Mon 22 Mar 2004 09:00:00 AM MST
18 point(s)
Pulling Out Tree Stump
You are in a truck trying to pull out a tree stump. The mass of the tree stump m is 170.0 kg. You have attached the winch at the front of the truck to the tree as shown in the diagram below:



As you try to pull out the stump with the truck, the winch exerts a time dependant force with magnitude: $F_{ws}(t) = F_0 e^{bt}$ where F_0 and b are constants, and t is the time since the winch began pulling. If the force necessary to remove the trunk is F_{out}, how long will it take to pull out the stump? Use the following values in your calculation: $F_0 = 20.0$ N
$b = 4.1$ s^{-1}
$F_{out} = 17000.0$ N
$\theta = 51.0$ degrees
$t_{out} =$
You are correct. Your receipt is 480-1079
Find the work done on the stump from the time that you start pulling the stump with the truck until the time that the stump comes out from the ground.
$W_{out} =$
Incorrect
Tries 16/99

Also, find the power delivered to the stump at half the time from when the truck starts to pull to when the stump breaks free ($t_{out}/2$).
$P_{out} =$
Tries 0/99

Once the stump breaks free, all horizontal forces on the stump except the force from the cable are negligible for a time, and the force from the wire as a function of **position** becomes: $F_{ws}(x) = \frac{F_{out}}{8}[1+7e^{-cx}]$ where F_{out} is the same as above, c is a constant, and x is the distance that the stump has traveled. After you pull out the stump, you drag it a horizontal distance x_1 with the truck. Find the work done on the stump by the winch from when it started moving until it reaches a distance x_1. The stump does not come off the ground during this time, and the angle doesn't change. Use the following values in your calculation: $c = 7.0$ m^{-1}
$x_1 = 3.9$ m
$\theta = 51.0$ degrees $W_1 =$
Tries 0/99

Find the speed of the stump when it is at position x_1. Remember, *all horizontal forces on the stump are negligible except the force from the cable until after the stump has traveled past x_1.*
$v_1 =$
Tries 0/99

What is the power being delivered to the stump by the cable when it is at the position x_1?
$P_1 =$
Tries 0/99