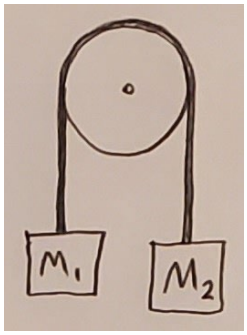
4) (25 points) Atwood machine

An Atwood machine consists of two weights, of potentially different masses M_1 and M_2, connected by an ideal rope that is supported by an ideal pulley, as shown in the diagram.



a) Draw a separate free body diagram for each of the two masses M_1 and M_2.

b) If $M_1 = M_2$, what is the tension in the rope?

c) For arbitrary values of M_1 and M_2, what is the tension in the rope?

d) In that case, what is the magnitude of the acceleration of M_1?

e) If the axle of the pulley is now accelerated upwards with an acceleration a_p, then what is the tension in the rope? As always, show your work and/or justify your answer.