10F Pulleys

1. Particles P and Q, of masses 2m and 3m, are attached to the ends of a light inextensible string. The string passes over a small, smooth, fixed pulley and the masses hang with the string taut. The system is released from rest.

a) Find the acceleration of each mass

b) Find the tension in the string, in terms of m

c) Find the force exerted on the pulley by the string, in terms of m

d) Find the distance travelled by Q in the first 4 seconds, assuming that P does not reach the pulley

e) Comment on any modelling assumptions used

2. Two particles A and B of masses 0.4kg and 0.8kg respectively are connected by a light inextensible string. Particle A lies on a rough horizontal table 4.5m from a small smooth fixed pulley which is attached to the end of the table. The string passes over the pulley and B hangs freely, with the string taut, 0.5m above the ground. The frictional force has a magnitude 0.08g. The system is released from rest. Find:

a) The acceleration of the system

b) The velocity at which B hits the ground

c) The total distance travelled by A before it comes to rest

d) (Bonus Question) The Force exerted on the pulley and the direction the force is in.