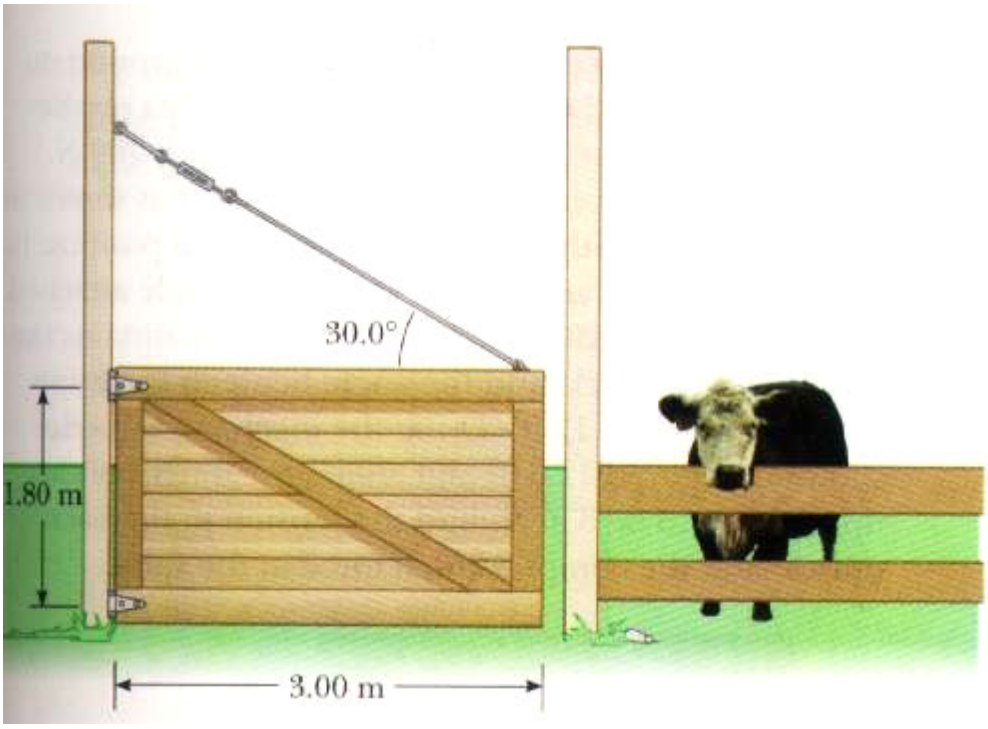
Physics 211 Problem Set 12 Due Fri, 11/22/19
Last Name:_____ First Name _____
Workshop time or section:_____TA name or Room # _____

Please submit your homework on this sheet. If you need more space than is available, please attach additional sheets of paper.

1. Old MacDonald had a farm, and on that farm he had a gate (see below). The gate is 3m wide and 1.8m high, with hinges attached to the top and bottom. The guy wire makes an angle of 30^0 with the top of the gate and is tightened by a turn buckle to a tension of 200 N. The mass of the gate is 32kg.



(a) Determine the horizontal force exerted on the gate by the bottom hinge.

(b) Find the horizontal force exerted on the gate by the upper hinge.

(c) Determine the combined vertical force exerted by both hinges.

Hints: You should start by drawing extended free-body diagram for the gate. Label the forces clearly. Write down three equilibrium conditions for the gate before you try to answer any questions.

Reaction forces from the hinges may have both horizontal and vertical components. Calculate torque relatively to the upper hinge as one of your equilibrium conditions (this simplifies algebra to be done).

Extended free-body diagram for the gate:

Equilibrium conditions:

(a) Solve the equilibrium conditions for the horizontal force exerted on the gate by the bottom hinge.

(b) Solve the equilibrium conditions for the horizontal force exerted on the gate by the upper hinge.

(c) Solve the equilibrium conditions for the combined vertical force exerted by both hinges.