Phy131 Third Homework Assignment
Due Wednesday January 27

Figures for the questions can be found on the homework page next to this assignment.

Question 1

An astronaut whose weight on earth is 700 Newtons travels to the moon. Find the weight and mass of the astronaut

a) on the moon
b) during the trip (while the space craft is "floating"). to the moon.

Question 2

Two forces act on a 26 Kg mass. One force is due west with a magnitude of 12 Newtons, and the second force is due north with a magnitude of 5 Newtons. Find:

a) the net force on the object.
b) the position of the object at time $t = 6$ seconds, if the object started from rest at the origin.

Question 3

What strength of fishing line is needed to stop a 20 pound salmon swimming at 8 ft/sec in a distance of 6 inches? You can express your answer in units of pounds. See the figures page.

Question 4

A force of magnitude F pulls a train of three cars to the right as shown on the figures page. The first car has a mass of $3M$, the second car has a mass of $2M$, and the last car has a mass of M. A rope connects each of the cars. Assume there is no friction and that the ropes are massless. Find:

a) The acceleration of the train. Express your answer in terms of F and M.
b) The tensions, T_1 and T_2, in each of the two ropes. Express your answer in terms of F.

Question 5

Jamie decides to do an experiment in an elevator. He suspends a block of mass 10 Kg by tying two strings to the sides of the elevator as shown on the figures page.

a) If the elevator is moving upwards with a **constant velocity** of 6 m/sec, find the tension (T_1, T_2, and T_3) in Newtons in each of the three strings.

b) If the maximum tension that the strings can stand without breaking is 160 Newtons, what is the maximum acceleration upward that the elevator can have without any of the strings breaking?

Question 6.

A ball is thrown **horizontally** from a cliff that is 64 feet high. when the ball hits the ground, its speed is twice its initial speed.

a) What is it's initial speed in units of ft/sec?
b) At what angle does the ball hit the ground?

Question 7

Captain Hertica of the Coast Guard wants to hit a target with the ship's gun as shown on the figures page. The target, a big balloon in the water, is located a horizontal distance of 100 feet from the ship. The gun is located at the edge of the ship and is 35 feet above the water. The captain wants the projectile to his the target exactly 5 seconds after it is shot.

At what angle, and with what velocity should the projectile be shot?

Question 8

Ellie wants to ride her bike over the canyon shown on the figures page. The edge that she rides off is 100 feet from the bottom and the side that she lands on is 36 feet above the bottom of the canyon. The canyon is 50 feet across. She needs our help to find the minimum speed to make it to the other side.

a) What is the minimum speed that she needs to make it to the other edge of the canyon?

b) How long is she in the air before she lands on the other side?