September 9 , 2021	Physics 210: UnTest #1:	Name _____

Instructions: You have a total of 50 minutes to complete this test.
Answer each of the following questions completely.

Time Start_____ Time finish_____ Pledged_____

You must supply all details that led to your answer.
You must provide correct SI units where required.
Do not discuss any aspect of this test with anyone until I return the test.

1. Consider the following 3 vectors given by $\vec{A} = 5\hat{i} - 2\hat{j}$; $\vec{B} = -4\hat{i} + 6\hat{j}$; $\vec{C} = -7\hat{i} + 8\hat{j}$.
What are the following quantities?
(Note: you must use vector notation in your answers where appropriate for credit)

(a) $\vec{A} + \vec{B} =$_____

(b) $2\vec{B} - \vec{C} =$_____

(c) $(\vec{B} - \vec{C}) \bullet \vec{A} =$_____

(d) $\vec{A} \bullet \hat{i} =$_____

(2) An object is observed to move along the x with a position which is given by:

$$x = d + bt + ct^2$$

where b, c and d are constants.

(a) find the velocity of the object as a function of time.

(b) find the acceleration of the object.

(c) Suppose $b = 1\frac{m}{s}; c = -5\frac{m}{s^2}; d = 0.5m$. At t=2 s, provide numerical answer for (a) and (b) above with correct SI units.

(c:1) v=_____

(c:2) a=_____

3. A ball is thrown from ground level with an initial velocity vector given by:
$\vec{v}_0 = v_{0,x}\hat{i} + v_{0,y}\hat{j} = 7\hat{i} + 3\hat{j}\ \frac{m}{s}$

(a) Find the maximum height to which the ball rises above the ground.

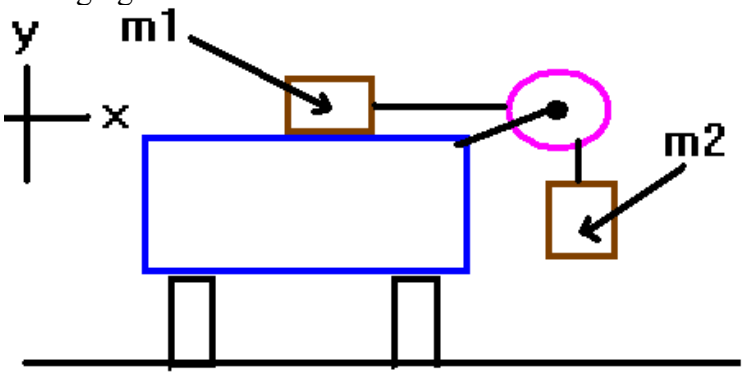
(b) Find the velocity vector at the instant the ball strikes the ground on the way down.

(c) Find the time that the ball is in the air.

(d) Find the **x-position** of the ball when the ball is at its maximum altitude.

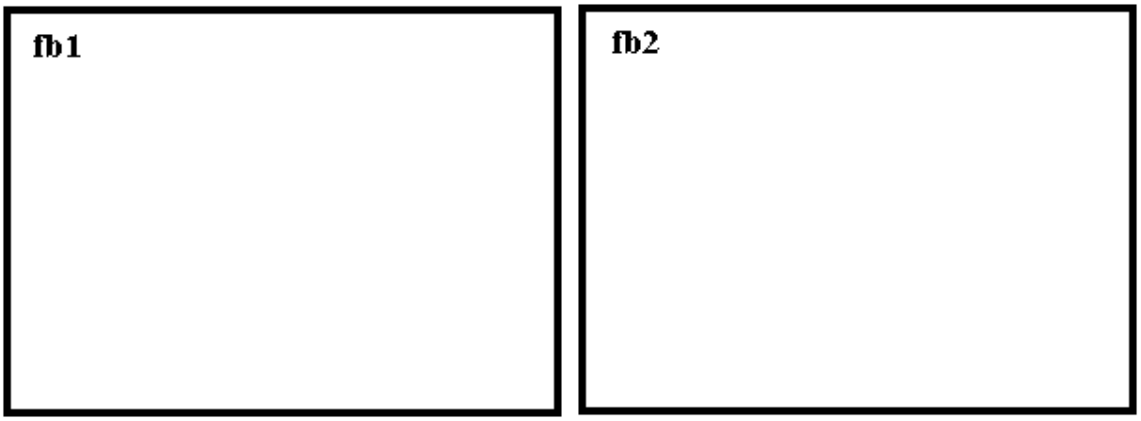
(e) Find the range of the ball.

(4) A mass m_1 is resting on a frictionless table and is connected by a massless string to a mass m_2 which is hanging over the side of the table as shown below.



(a) On the diagram above, show and label all forces which are acting on the masses, being sure to use sufficient and clear labels. Be very clear about simplifications.

(b) Draw correct free body diagrams of the situation. You may need to make a second sketch of the problem before doing part b.



(c) Solve for the **tension and acceleration** of the system. Your answers here involve g, m_1, and m_2.

(d) Suppose m_1=4 kg and m_2=2 kg. Provide numerical answers to part (c) together with correct SI units.

(d:1): T=_____

(d:2): a=_____