September 9, 2020	Physics 210: UnTest 1	Name: _____

Instructions: You have a total of 50 minutes to complete this test.
Answer each question completely showing complete details.
For complete credit you must include correct SI units with numerical answers.

Time Start_____ Time finish _____pledged _____

Constants: $g = 9.8 \frac{m}{s^2}$

(1) A particle is observed to move with a constant acceleration given by:

$$\vec{a} = 0\,\hat{x} - e\,\hat{y}$$

where the constant e has SI units of $[e] = \left[\frac{m}{s^2}\right]$.

(a) Find the velocity **vector** at a later time assuming that at t=0 the initial velocity vector is zero.

(b) Find the position **vector** at a later time assuming that at t=0, the velocity and position vectors are both zero.

Suppose another particle is seen to have a position vector given by:

$$\vec{R}(t) = (v_{0,x}t)\,\hat{x} + (v_{0,y}t - kt^2)\,\hat{y} \quad .$$

The constant k has SI units of $[k] = [\frac{m}{s^2}]$.

(c) Find the velocity **vector** at a later time.

(d) Find the acceleration **vector** at some later time.

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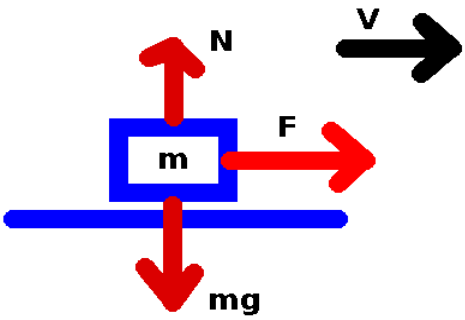
(2) A mass is resting on a table and a force F is as shown. There is a kinetic coefficient of friction between the mass and the table of μ. You may assume F is large enough to accelerate the mass and that the mass is given a theoretical push so that it is moving.



(a) On the diagram below, sketch and label the frictional force, f.

(b) In the box above, draw a complete and correct free body diagram for this system.

(c) Provide the 2 equations that come from Newton's Laws for this system and the frictional force. You will have 3 equations total here.

(d) Solve for the frictional force in terms of **μ, m and g**.

(e) Find the acceleration of the system **in terms of m, F, μ and g**.

(f) Find the velocity of the mass at a time t **in terms of m, F, μ and g** . You may assume the initial velocity here is zero.

(g) If M=1kg, F=3N, μ=0.2 and t=5 s, then provide numerical answers for a and v **together with correct SI units.**

a=_____ v=_____

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(3) A ball is thrown upward at an angle of 35^0 with respect to the horizontal direction with an initial velocity of 10 m/s. Answer the following questions, **providing correct SI units.**

(a) How long is the ball in the air?

(b) What is the maximum height to which the ball rises?

(c) What is the impact velocity **vector** of the ball?

(d) What is the range of the ball?

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(4) Consider the following vectors:

$$\vec{A}=3\,\hat{x}-1\,\hat{y}\,:\,\vec{B}=-3\,\hat{x}+4\,\hat{y}\,:\,\vec{C}=5\,\hat{x}-6\,\hat{y}$$

(a) $\vec{A}-\vec{C}=$ _____

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

(c) $\left|\vec{A}+\vec{C}\right|=$ _____

(d) $\vec{C}\bullet\hat{x}=$ _____