Date: _____ Mods _____ Name: _____

Mr. Forrest: AP Physics C: 2019

AP Physics Review Practice

Set # 5 of 6: Alternate version

Directions: Answer all questions. The suggested time is about 15 minutes for answering each of the questions, which are worth 15 points each.

Topic: Kinematics, Forces, Projectiles

30 minute time cap for Set # 5: You may take more than 30 minutes, but only score yourself on the work you do in the 1st 30 minutes

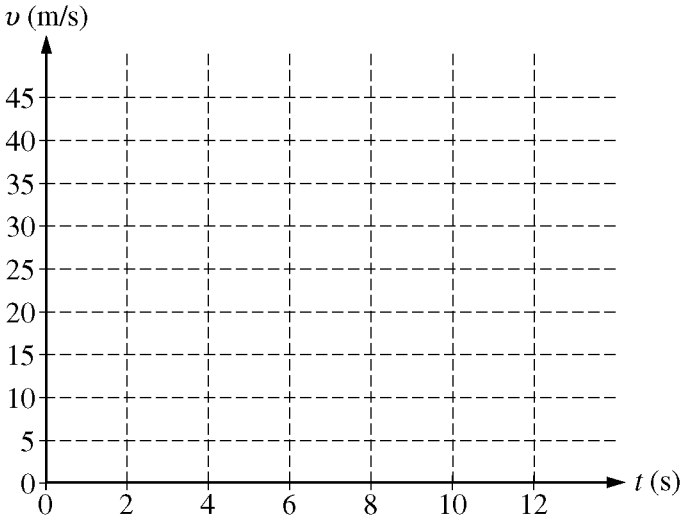
M1-2017 exam (15 pt) and M1-2015 prac. exam (15 pt)

2015 Mech 1 From Practice Test

A new sports car is undergoing acceleration tests to determine its specifications (Mr. Forrest is hoping it can replace his recently lost Nissan Z ☹). The following data on speed *v* versus time *t* are recorded for the car as it accelerates from rest along a straight track.

v (m/s)	0	14	23	30	35	39
t (s)	0	2	4	6	8	10

(a) i. On the axes below, plot *v* as a function of *t* and sketch a curve that best represents the data. (3 pt)



i. Using the data provided, estimate the velocity at *t* = 12 sec. in the space below. (1 pt)

(b) Answer each of the following for the time period t = 0 s to t = 10 s.

i.Does the speed of the car increase, decrease, or stay the same? (2 pt)

____ Increase ____ Decrease ____ Stay the same

Justify your answer.

ii. Does the acceleration of the car increase, decrease, or stay the same? (2 pt)

____ Increase ____ Decrease ____ Stay the same

Justify your answer.

(c) Explain how you would use your graph in part (a) to find the distance traveled by the car between t = 2 s and t=8s. (2 pt)

The equation for the speed v of the car as a function of time t found from the graph is $v(t) = -0.3t^2 + 7t$, where v is in meters per second and t is in seconds.

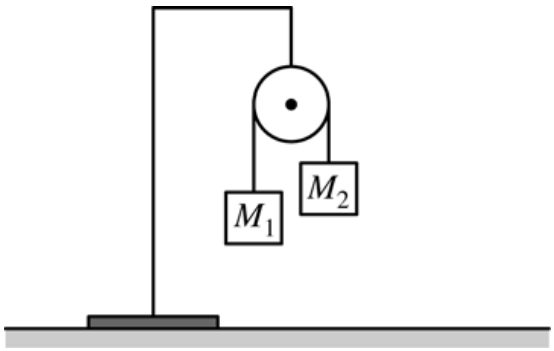
(d) Derive an expression for the acceleration of the car $a(t)$ as a function of time t . (2 pt)

*** (e) ~~Calculate the position of the car as a function of time, $x(t)$, assuming that the car starts from rest at the origin of a coordinate system~~.

DO NOT ANSWER THIS AT THIS TIME – WE'LL DO THIS IN A FEW WEEKS WHEN YOU GET TO THIS POINT IN CALCULUS (OR WHEN MR. FORREST EXPLAINS THIS IN CLASS)

(f) Estimate the distance traveled by the car between t = 2 s and t = 8 s and explain your method below.

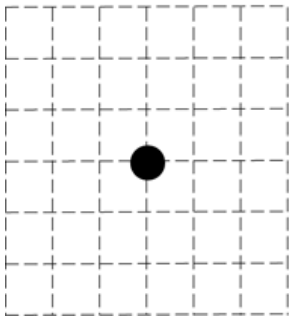
2017 EXAM MECH # 1 {6.29 /15 = Avg.}



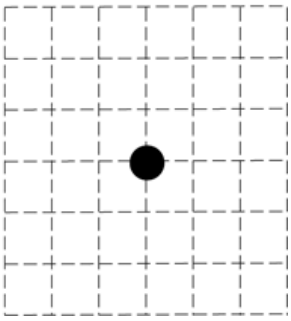
An Atwood's machine consists of two blocks connected by a light string that passes over a frictionless pulley of negligible mass, as shown to the right. The masses of the two blocks M_1 and M_2, can be varied. M_2 is always greater than M_1.

a) (3 pt) On the dots below, which represent the blocks, draw and label the forces (not components) that act on the blocks. Each force must be represented by a distinct arrow starting on and pointing away from the appropriate dot. The relative lengths of the arrows should show the relative magnitudes of the forces.

Block of Mass M_1



Block of Mass M_2



b) (3 pt) Using the forces in your diagrams above, write an equation applying Newton's second law to <u>each</u> block and use these two equations to derive the magnitude of the acceleration of the blocks and show that it is given by the equation: $a = \frac{(M_2 - M_1)}{(M_1 + M_2)} g$

The magnitude of the acceleration a was measured for different values of M_1 and M_2, and the data are shown below.

M_1 (kg)	1.0	2.0	5.0	6.0	10.0
M_2 (kg)	2.0	3.0	12.0	8.0	14.0
a (m/s^2)	3.02	1.82	4.21	1.15	1.71

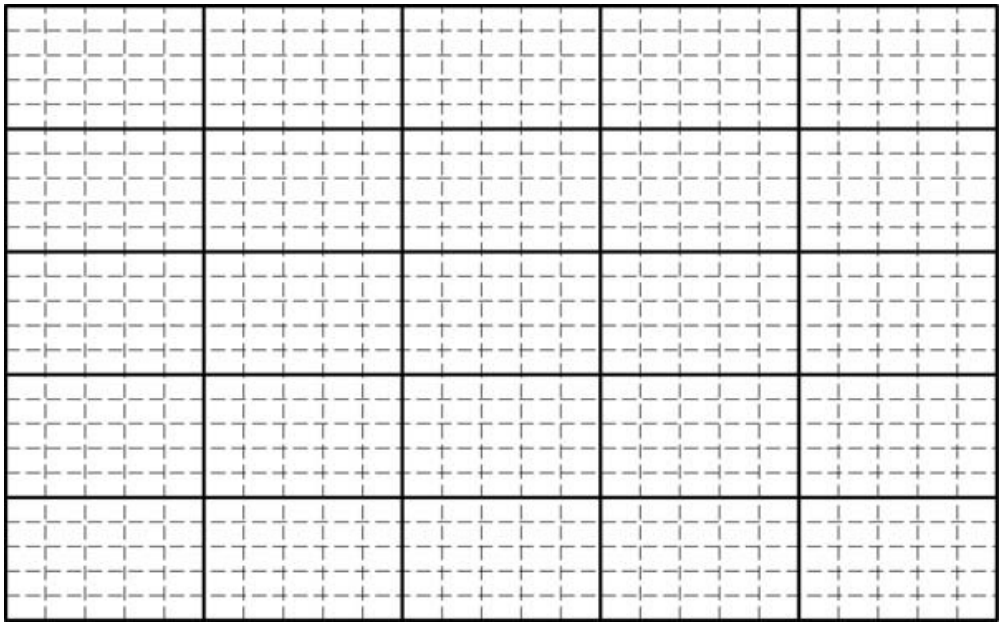
c) (1 pt) Indicate below which quantities should be graphed to yield a straight line whose slope could be used to calculate a numerical value for the acceleration due to gravity g.

Vertical axis: _____

Horizontal axis: _____

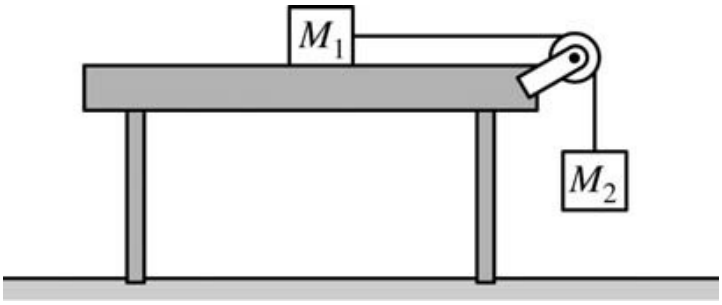
Use the remaining two rows in the table above, as needed, to record any quantities that you indicated that are not given.

d) (3 pt) Plot the data points for the quantities indicated in part (c) on the graph below. Clearly scale and label all axes including units, if appropriate. Draw a straight line that best represents the data.



e) (2 pt) Using your straight line, determine an experimental value for g.

The experiment is now repeated with a modification. The Atwood's machine is now set up so that the block of mass M_1 is on a smooth horizontal table and the block of mass M_2 is hanging over the side of the table, as shown.



f) (2 pt) For the same values of M_1 and M_2, is the magnitude of the tension in the string when the blocks are moving higher, lower, or equal to the magnitude of the tension in the string when the blocks are moving in the first experiment?

_____ Higher _____ Lower _____ Equal to

Justify your answer.

g) (1 pt) The value determined for the acceleration due to gravity g is lower than in the first experiment. Give one physical factor that could account for this lower value and explain how this factor affected the experiment.