AP Physics 1
Introduction

Name_____**Period** ____ **Date** _____

Linearization of Data

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For each data set given, determine the mathematical expression to describe the relationship between the two quantities. First, graph the original data. Plot the first column in each data set as the **independent** (x) variable and the second column as the **dependent** (y) variable. Use the shape of the graph to modify the data so that it plots as a straight line. Using the slope and intercept, write an appropriate mathematical expression for the relationship between the variables. Sketch plots of your original, any intermediate, and your final graphs on the graph paper provided. Be sure to include labels and units in your graphs and equations!

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Data set 1

V (m^3)	**P** (pa)
0.1	40
0.5	8
1	4
2	2
4	1
5	0.8
8	0.5
10	0.4

Data set 2

t (s)	**D** (m)
.1	.03
.2	.12
.5	.75
1	3
2	12
3	27
4	48
5	75

Mathematical expression #1:

Mathematical expression #2:

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Data set 3

A (months)	**W (lbs)**
1	7.3
2	9.4
3	10.5
4	12.0
5	13.0
6	14.3
7	15.2
8	16.7

Mathematical expression #3:

Data set 4

t (s)	**v (m/s)**
.3	10
1.2	20
2.7	30
4.8	40
7.5	50
10.8	60
14.7	70
19.2	80

Mathematical expression #4:

5)

Masses are hung on a suspended spring and the corresponding stretch is noted (measured from the original position of the lower end of the spring).The results shown to the right were obtained. (Make the graphs for the two sets of data on the same set of axes.)

Graph these data.

a. Does the graph have a constant slope? What is it?
b. Write a mathematical expression that describes the behavior of this spring.
c. What stretch would you expect if 9.3 kg were placed on this spring? There is more than one way to answer this question. Describe two!

Mass (kg)	Stretch (m)
0	0.00
4	0.16
6	0.24
8	0.32
14	0.56
20	0.80

6)

Another group did the same experiment using the same spring, but measured the stretch from the point of connection of the spring rather than from the bottom of the spring. Their results are shown to the right.

Make a graph of these data on the same set of axes as before.

d. Write a mathematical expression that describes the behavior of the spring.
e. How do the slopes of the two graphs compare?
f. Why do the graphs look different if they are describing the same spring?
g. How long was the spring?

Mass (kg)	Stretch (m)
0	1.00
4	1.15
6	1.23
8	1.32
14	1.57
20	1.80

7)

The following data were determined for an object dropped from rest near the surface of the moon. The data in the table indicate the total distance fallen by the object and the time required to fall that distance, and were determined by measuring the total distance fallen at the end of each second. Using these data and as many graphs as are necessary, determine a mathematical expression (as specifically as possible) which describes the relationship between the distance fallen by the object and the time required to fall that distance. Show all steps of a proper mathematical analysis.

Time to fall (s)	Distance fallen (m)
0.0	0.0
1.0	0.9
2.0	3.2
3.0	6.9
4.0	13.1
5.0	20.2
6.0	28.2
7.0	39.4
8.0	51.2

8)

The following data were collected in an experiment designed to test the effect of changing mass on the acceleration of an object when a constant force acts upon it. The data table describes the total mass on the object and its corresponding acceleration. Using these data and as many graphs as are necessary, determine a mathematical expression (as specifically as possible) which describes the relationship between the acceleration of the object and the mass of the object.

Mass of object (kg)	Acceleration (m/s2)
1.0	20.2
2.0	9.8
3.0	6.8
4.0	5.0
5.0	3.9
6.0	3.4
7.0	2.9