

Physics 1100

Student's Name

Institution Affiliation

Course Number and Name

Instructor

Date

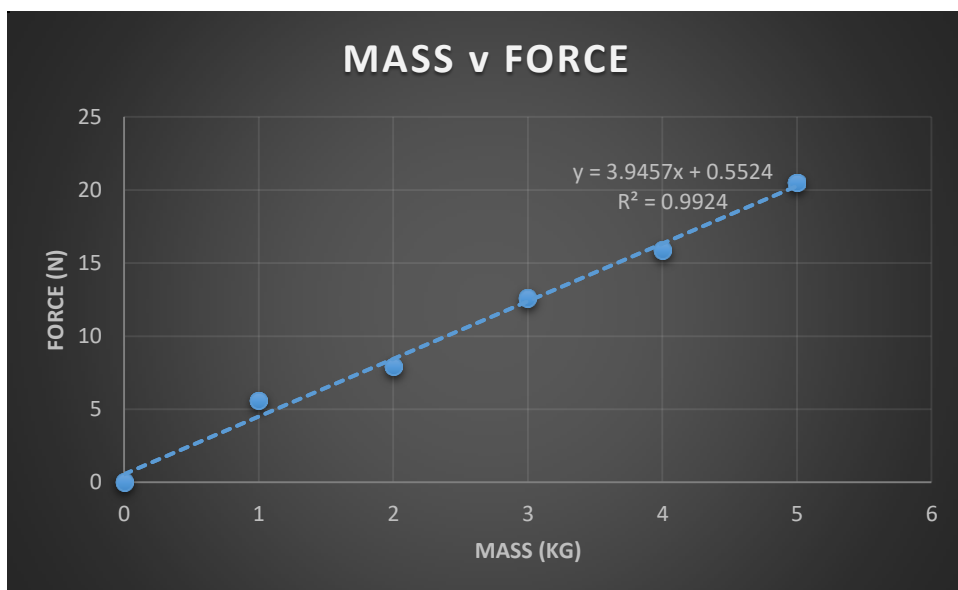
Physics 1100**Hw 1**

For each data set below, determine the mathematical expression.

- a) A student places various masses on a table and measure the force needed to drag them across the table.

1. Mass (kg) Force (N)

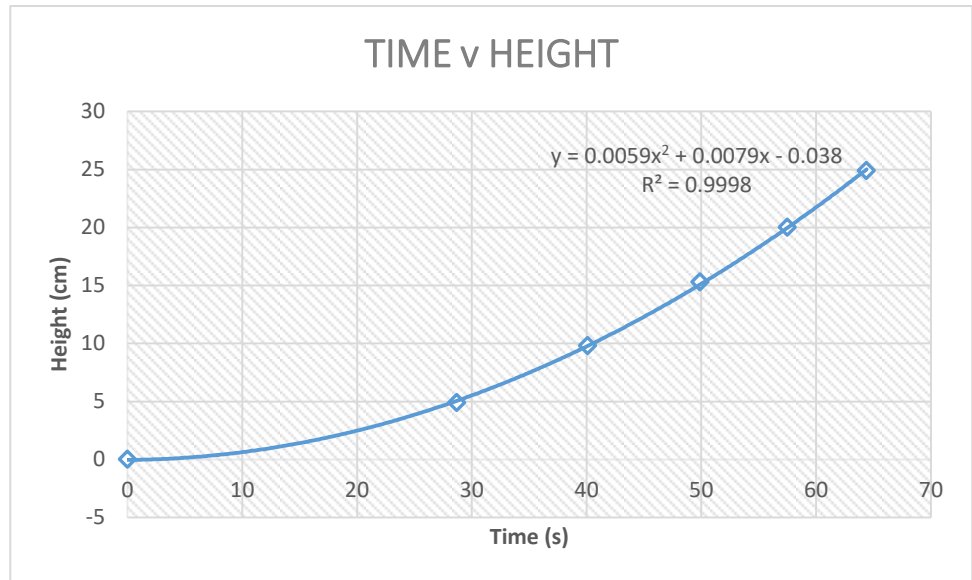
0	0
1	5.6
2	7.9
3	12.6
4	15.9
5	20.5



b) As time goes on, the height of a pile of sand in an hourglass is measured.

Time (s) Height (cm)

0	0
28.7	4.9
40.1	9.8
49.9	15.3
57.5	20
64.4	24.9



2. Express this numbers in scientific notation

a) $0.123 = 1.23 \times 10^{-1}$

b) $11,200 = 1.12 \times 10^4$

c) $450,000 = 4.5 \times 10^5$

3. Express this numbers in decimal notation

a) $1.5 \times 10^{-5} = 0.000015$

b) $9.2 \cdot 10^9 = 9,200,000,000$

c) $5.2 \cdot 10^{-6} = 0.0000052$

4. Use your calculator to solve the following. Be sure to express your answers in scientific notation.

a) $(1.2 \cdot 10^4)(8.4 \cdot 10^{-9}) =$

$$12,000 \times 0.0000000084 = 0.0001008$$

Scientific notation answer equals, 1.0×10^{-4}

b) $(9.3 \cdot 10^{-15})(1.2 \cdot 10^9) =$

$$0.00000000000000093 * 1200000000 = 0.00001016$$

Scientific notation answer equals, 1.1×10^{-5}

c) $(3.7 \cdot 10^8)(5.7 \cdot 10^{-13}) =$

$$370000000 * 0.00000000000057 = 0.0002109$$

Scientific notation answer equals, 2.1×10^{-4}

d) $(7.2 \cdot 10^{12})(6.5 \cdot 10^{-2}) / 7.5 \cdot 10^{-13} =$

$$7200000000000*0.065/0.00000000000075=62.4020$$

Scientific notation answer equals, 6.2×10^{21}

e) $(6.6 \cdot 10^{12})(1.5 \cdot 10^8) / (2.1 \cdot 10^{-3})(7.8 \cdot 10^{-25})$

$$6600000000000 * 150000000 / 0.0021 * 0.00000000000000000000078 =$$

6.043956044000 recurring

Scientific notation answer equals, 6.0×10^{47}

5. Indicate how many significant figures there are in each of the following measured values.

a) $46.43=4$

b) $107.850=6$

c) $100.30= 5$

d) $0.6780=4$

e) $1.0008=5$

6. Calculate the answers to the appropriate number of significant figures.

a) $26.20+28.28+9= 63$

b) $658.0-23.547= 634.5$

7. Calculate the answers to the appropriate number of significant figures

a) $43.7*2.8= 120$

b) $65.76*0.29=19$

c) $1.677/0.42=4.0$

d) $28.367/3.84=7.39$

e) $1278/1.008=1268$

f) $(2.3*10^9)(4.7*10^{-110})/(8.2*10^{-4})(1.7*10^{12})=7.8*10^{11}$

8. Determine the final units in the following problems

a) $\text{Km}*\text{km}= \text{km}^2$

b) $\text{m}*\text{m}*\text{m}=\text{m}^3$

c) $\text{m}*\text{m}/\text{m}=\text{m}$

d) $\text{kgm}^2/\text{m}= \text{kgm}$

e) $\text{kgm}^3/\text{ms}^2 =\text{kgm}^2/\text{s}$

f) $\text{m}^3/\text{ms}^2=\text{m}/\text{s}^2$

Lab 1 Curve Fitting Part A

x-axis y-axis

1.1 1.1

2.4 3.4

4.9 3.2

8.8 4.3

9.0 6.4

Turn on the values in the top right menu. Place points on the graph at the following locations and answer the questions below.

- 1) Click on linear and record the value for x^2 and r^2 . Change the option from linear to quadratic and record the values for X^2 and R^2 below. Notice that the x^2 value enters the red zone when the quadratic choice is selected, which means that even though the r^2 values are the same, a higher x^2 means that linear is a better choice for the curve.

Linear x^2 values = 32.0 and r^2 = 0.53

Quadratic x^2 values = 34.5 and r^2 = 0.54

- 2) The equation for any straight line is $y = mx + b$, where m = slope, and b = the y -intercept. Find the equation for the line on this graph at the top of the graph and record it below. Indicate the slope of the line.

The equation is $y = 0.49x + 0.9$

Slope = 0.49

- 3) Sometimes we collect data and find that a point is above or below the curve. This is called an outlier. If the point is removed, the graph should improve, but it's important to try to find a reason for the point being an outlier, since an error occurred. Remove the data point 8.8, 4.3, by returning it to the basket. Change back to linear and record the new values for x^2 and r^2 below. What happens to the r^2 and x^2 values? What does this indicate?

Linear $x^2 = 31.5$ and $r^2 = 0.61$

This indicates the accuracy of the data as r^2 increases from 0.53 to 0.61 and x^2 decreases from 32.0 to 31.5

- 4) Remove the data point 2.4, 3.4. Record the. What happens to the x^2 and r^2 values? What does this indicate?

Linear $x^2 = 37.4$ an increase from 31.5 to 37.4 and $r^2 = 0.63$ increases from 0.63 to 0.61

This shows how the data becomes perfect correlated but with tendency to reduce accuracy.

- 5) Switch from linear to quadratic and record the new values for x^2 and r^2 below.

Based on the x^2 and r^2 values, is linear still the best choice for the curve or is quadratic now a better choice? Explain.

$$X^2 = 42.1$$

$$r^2 = 0.65$$

Basing on the outcome of x^2 and r^2 values linear still remains to be the best choice for the curve and not quadratic this is because x^2 values keeps on rising on removal of outliers.

Part B

Put all the points back in the basket. Place the following points on the graph and answer the questions below.

x-axis y-axis

1.2 1.2

3.8 2.8

6.2 3.8

8.3 5.9

9.4 8.3

- 1) Click on linear and record the r^2 value and x^2 values, then click on quadratic and record the x^2 and r^2 values below.

Linear values $x^2 = 9.71$ and $r^2 = 0.38$

Quadratic values $x^2=9.59$ and $r^2= 0.47$

- 2) Based on the x^2 and r^2 values which curve is a better fit for this data?

Linear is the best curve for this data because the X^2 values are high than r^2 in both linear and quadratics

- 3) Find and remove the outlier (a point that is above or below the line in this case 8.3, 5.9) and record the new values for x^2 and r^2 below.

Linear values $x^2 = 10.8$ and $r^2 = 0.33$

Quadratic values $x^2=11.2$ and $r^2= 0.42$

- 4) Is the linear or quadratic a better fit for the graph without the outlier? Explain.

Linear still remains the best fit for the graph without the outlier because the x^2 values are high in both cases with or without the outlier indicating linear as the best curve to present the data.