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| **Worksheet for Lab on Hand Graphing:** | **Name** |  |
|  |  |  |
|  | **Date** |  |

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|  | **Partner #1** |  |
|  |  |  |
|  | **Partner #2** |  |

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| **Exercises to be turned in:** |
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| **3. Exercise: A Linear Plot** |
| The data tabulated here is hypothesized to have a linear trend. Make a graph of 𝑅 versus 𝑣 to verify this. Find the slope and the intercept. Follow the same methods as for the example above. Be sure to include units and proper formats for axis labels and plot titles which should include your name and the date you did the work. |
|

|  |  |
| --- | --- |
| $$v \left(^{m}/\_{s}\right)$$ | $$R\left(^{kg}/\_{s}\right)$$ |
| 2.5 | 32.75 |
| 3.5 | 28.25 |
| 4.5 | 23.75 |
| 5.5 | 19.25 |
| 6.5 | 14.75 |
| 7.5 | 10.25 |
| 8.5 | 5.75 |
| 9.5 | 1.25 |
| 10.5 | -3.25 |
| 11.5 | -7.75 |

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| **Slope:** |  |
|  |  |
| **y-intercept:** |  |

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| **6. Exercises for Non-Linear Plots** |
|  |
| Using our assumed relationship is  |
| $$m=\frac{1}{2}qt^{2}$$ |
| The data is  |
|

|  |  |  |  |
| --- | --- | --- | --- |
| Time (sec) | Mass (kg) |  |  |
| 2.0 | 4 |  |  |
| 3.0 | 21 |  |  |
| 4.0 | 33 |  |  |
| 5.0 | 43 |  |  |
| 6.0 | 74 |  |  |
| 7.0 | 90 |  |  |
| 8.0 | 126 |  |  |
| 9.0 | 163 |  |  |
| 10.0 | 194 |  |  |
| 11.0 | 230 |  |  |

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| **6.1 Linearization by Powers** |
| Choose to linearize this by either plotting *m* versus *t2* or plotting $\sqrt{m}$ versus $t$ |
|  |
| Fill in the two columns so that you can more easily create a plot that will be linear. Create the plot you choose and determine the slope and y-intercept of the “best straight line”. Remember to use proper axis labels, and plot titles including your name and the date you did the work. |
|  |
| For whichever method you choose, write out the steps to allow you to solve for *q* from the determined slope and/or y-intercept. Put in the values and determine the value of q include units. |
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| **Derivation of q:** |
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| --- | --- |
| **Slope:** |  |
|  |  |
| **y-intercept:** |  |
|  |  |
| **q** |  |

 |
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| **6.2 Use Logarithms to Linearize the data** |
|  |
| Fill in the two columns to allow you to more easily create the ln-ln plot. |
|

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| --- | --- | --- | --- |
| Time (sec) | Mass (kg) |  |  |
| 2.0 | 4 |  |  |
| 3.0 | 21 |  |  |
| 4.0 | 33 |  |  |
| 5.0 | 43 |  |  |
| 6.0 | 74 |  |  |
| 7.0 | 90 |  |  |
| 8.0 | 126 |  |  |
| 9.0 | 163 |  |  |
| 10.0 | 194 |  |  |
| 11.0 | 230 |  |  |

 |
|  |
| Create the plot and determine the slope and y-intercept of the “best straight line”. Remember to use proper axis labels, and plot titles including your name and the date you did the work. |
|  |
| Write out the steps to allow you to solve for *q* from the determined slope and/or y-intercept. Put in the values and determine the value of q include units. |
|  |
| **Derivation of q:** |
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| --- | --- |
| **Slope:** |  |
|  |  |
| **y-intercept:** |  |
|  |  |
| **q** |  |

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| **6.3 Compare Results** |
| Finally, compare your values of q from the two different methods (Linearize by Powers or Linearize using Logarithms). Calculate a percentage difference using the formula |
|  |
| $$\%diff=\left|\frac{q\_{Powers}-q\_{Ln}}{q\_{ave}}\right| x 100\%=2\left|\frac{q\_{Powers}-q\_{Ln}}{q\_{Powers}+q\_{Ln}}\right| x 100\%$$ |
|  |
| Fill in the values and calculate: |
|  |
| $$\%diff=2\left|\frac{q\_{Powers}-q\_{Ln}}{q\_{Powers}+q\_{Ln}}\right| x 100\%=2\left|\frac{-}{ + }\right| x 100\%= $$ |
|  |
|  |
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|  |  |
| --- | --- |
| **%diff** |  |

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