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| **Worksheet for Lab on One Dimensional Motion** | **Name** |  |
| **With Constant Acceleration.** |  |  |
|  | **Date** |  |

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

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| **Graph #1 –** $∆x$ **vs t** |
|  |
| First plot $∆x$ versus t ($∆x$ on the vertical axis and t on the horizontal axis) and see what the relationship looks like. If the data agrees with the theoretical relationship, the plot should be a parabola. You should be able to verify that the plot is not straight. |
|  |
| Create the graph, ensuring that it has the required elements: a title, your name, the date, axes labeled with the name, symbol, and units of the variable, etc. Since the data does not form a straight line, **do not include** a best-fit line through the data. |
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| Place the Plot after this page. |
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| **Graph #2 –** $∆x$ **vs** $t^{2}$ **– Linearize by Powers** |
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| Create the plot. This time put in a trendline. Reformat the trendline to change y and x to $a$ and $t^{2}$ also add units where appropriate to the numbers. Remember the required elements: a title, your name, the date, axes labeled with the name, symbol, and units of the variable, etc. |
|  |
| Work out the steps (type them below) to show how the acceleration is determined from the Slope and/or the Y-intercept. Determine the acceleration. |
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| **Slope:** |  |
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| **y-intercept:** |  |
|  |  |
| **a** |  |

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| Place the Plot after this page. |
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| **Graph #3 – Logarithmic Analysis** |
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| Create the plot. Put in a trendline. Reformat the trendline to change y and x to $ln\left(∆x\right)$ and $ln\left(t\right)$also add units (ln(units)) where appropriate to the numbers. Remember the required elements: a title, your name, the date, axes labeled with the name, symbol, and units of the variable, etc. |
|  |
| Type in the steps going from $∆x=\frac{1}{2}at^{2}$ to the equation $ln\left(∆x\right)=2ln\left(t\right)+ln\left(\frac{1}{2}a\right)$ |
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| Work out the steps (type them below) to show how the acceleration is determined from the Slope and/or the Y-intercept. Determine the acceleration. |
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| **Slope:** |  |
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| **y-intercept:** |  |
|  |  |
| **a** |  |

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| Place the Plot and the Workbook print out after this page. |
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| **Final Comparison of Accelerations** |
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| Compare your values of *a* from the two different methods (Linearize by Powers or Linearize using Logarithms). Calculate a percentage difference using the formula |
|  |
| $$\%diff=\left|\frac{a\_{Powers}-a\_{Ln}}{a\_{ave}}\right| x 100\%$$ |
| First find  |
| $$a\_{ave}=\frac{a\_{Powers}+a\_{Ln}}{2}=\frac{ + }{2}=$$ |
|  |
|

|  |  |
| --- | --- |
| $$a\_{ave}=$$ |  |

 |
|  |
| Fill in the values and calculate: |
|  |
| $$\%diff1=\left|\frac{a\_{Powers}-a\_{Ln}}{a\_{ave}}\right| x 100\%=\left|\frac{-}{ }\right| x 100\%= $$ |
|  |
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| **%diff1 =** |  |

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|  |
| Now measure angle $θ$ |
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| $$θ=$$ |  |

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| Calculate acceleration from  |
| $$a\_{calc}=g\sin(\left(θ\right)=\left(980. ^{cm}/\_{s} \right))\sin(\left( \right))=$$ |
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| $$a\_{calc}=$$ |  |

 |
|  |
| $$\%diff2=\left|\frac{a\_{calc}-a\_{ave}}{a\_{calc}}\right| x 100\%=\left|\frac{-}{ }\right| x 100\%= $$ |
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| **%diff2 =** |  |

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