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| **Worksheet for Lab on Uniform Circular Motion** | **Name** |  |
|  |  |  |
|  | **Date** |  |

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

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| **Analysis Exercise #1 – Data Table** |
| Create a data table in excel with the following columns: |
|  |
|  |
|  |
| Print the data table and place it after this page. |
|  |
| **Analysis Exercise #2 – Ln(T) vs Ln(m-total) Plot** |
|  |
| Begin with the relationship: |
| $$T=\left(\frac{4π^{2}R}{F\_{s}}\right)^{^{1}/\_{2}}m^{^{1}/\_{2}}$$ |
| And below provide the steps to arrive at the Ln-Ln relationship” |
| $$Ln\left[T\right]=\frac{1}{2}Ln\left[m\right]+Ln\left[\left(\frac{4π^{2}R}{F\_{s}}\right)^{^{1}/\_{2}}\right]$$ |
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|  |
| Create a full-page plot of Ln (Period) vs Ln (Total Mass). Include proper formatting of Title, axis labels, and a properly formatted Trendline. Place the printed plot after this page. |
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|  | **Slope:** |  |
|  |  |  |
|  | **Y-intercept:** |  |

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|  |
| According to the theory which you just wrote out, what should the slope of the Ln(T) vs Ln(m) plot have been? |
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| **Theory – Slope:** |  |

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|  |
| What is the percent difference between theory and measured slope? |
|  |
| $$\%diff=\frac{Slope\_{Theory}-Slope\_{exp}}{Slope\_{Theory}} x 100\%$$ |
|  |
|

|  |  |
| --- | --- |
| $$\%diff\_{Slope}=$$ |  |

 |
|  |
| Start with the theoretical y-intercept expression here: |
|  |
| $$b=Ln\left[\left(\frac{4π^{2}R}{F\_{s}}\right)^{^{1}/\_{2}}\right]$$ |
|  |
| Below work out what the Spring Force $F\_{s}$ should be in terms of b, R, and $4π^{2}$. You should get  |
|  |
| $$F\_{s}=4π^{2}Re^{-2b}$$ |
| Show the algebra below  |
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| Now, plug in the values and get the theoretical spring force. Then compare it with the force you measured from putting masses on the string pulling the bob out to be vertical.  |
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| **Theory – Spring Force** $F\_{s}$**:** |  |

 |
|  |
| What is the percent difference between theory and measured slope? |
|  |
| $$\%diff=\frac{F\_{s}\_{Theory}-F\_{s}\_{exp}}{F\_{s}\_{Theory}} x 100\%$$ |
|  |
|

|  |  |
| --- | --- |
| $$\%diff\_{F\_{s}}=$$ |  |

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| **Analysis Exercise #3 – T vs** $\sqrt{\left(m-total\right)}$ **Plot** |
|  |
| Create a full-page plot of T vs $\sqrt{\left(m-total\right)}$. Include proper formatting of Title, axis labels, and a properly formatted Trendline. Place the printed plot after this page. |
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| **Slope:** |  |
|  |  |
| **Y-intercept:** |  |

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|  |
| Start with the theoretical slope expression here: |
| $$Slope=\left(\frac{4π^{2}R}{F\_{s}}\right)^{^{1}/\_{2}}$$ |
| Below work out what the Spring Force $F\_{s}$ should be in terms of b, R, and $4π^{2}$. You should get  |
|  |
| $$F\_{s}=\frac{4π^{2}R}{\left(Slope\right)^{2}}$$ |
| Show the algebra below |
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|  |
| Now, plug in the values and get the theoretical spring force. Then compare it with the force you measured from putting masses on the string pulling the bob out to be vertical.  |
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| **Theory – Spring Force** $F\_{s}$**:** |  |

 |
|  |
| What is the percent difference between theory and measured slope? |
|  |
| $$\%diff=\frac{F\_{s}\_{Theory}-F\_{s}\_{exp}}{F\_{s}\_{Theory}} x 100\%$$ |
|  |
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| --- | --- |
| $$\%diff\_{F\_{s}}=$$ |  |

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