Take-home Assignment

Due at beginning of lab, Oct. 6

Stolen from Dr. Pogozelski

Name _____

The following quantities are known:

$g = 9.80\text{m/s}^2 \pm 0.01\text{m/s}^2$ $r = 8.0\text{cm} \pm 0.1\text{ cm}$ $L = 15.0\text{cm} \pm 0.3\text{ cm}$

The units of some other symbols used below are: $t \rightarrow$ seconds, $h \rightarrow$ meters.

1. Find the derivatives indicated. For parts a) and b), also compute the derivative's value. For part d), first solve for a.

Example: $J = A + 2\pi rL - L^2$ Derivative: $\frac{dJ}{dL} = 2\pi r - 2L$ Value:20.265 cm

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a) $V = \frac{4}{3}\pi r^3 + \pi r^2 L$ Derivative: $\frac{\partial V}{\partial r} =$ Value:

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b) $V = \frac{4}{3}\pi r^3 + \pi r^2 L$ Derivative: $\frac{\partial V}{\partial L} =$ Value:

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c) $a = \frac{(m_2 - \mu_k m_1)}{m_1 + m_2} g$ Derivative: $\frac{\partial a}{\partial \mu_k} =$

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d) $h = \frac{1}{2} a t^2$ $a =$ Derivative: $\frac{\partial a}{\partial t} =$

2. In the above expressions:

a) What are the units of A?_____

b) What are the units of a?_____

c) What are the units of V?_____

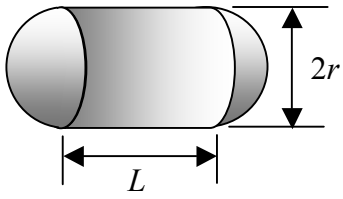
d) What are the units of μ_k?_____

e) What are the units of $\partial V/\partial r$? _____

f) What are the units of $\partial V/\partial L$?_____

NOTE: Given quantities from first side still apply…

3. You intend to compute the volume of a cylinder with hemispherical ends, the formula for which is $V = \frac{4}{3}\pi r^3 + \pi r^2 L$. Show your work.



a) What is the value of $\overline{V}$?

For (b) and (c), you should have no calculus. Use the results of question 1.

b) What is the value of δV_L ?

c) What is the value of δV_r ?

d) What is the value of δV ?

e) Write the volume of this object using presentation format: $V =$_____

f) Which would be more effective for reducing the volume uncertainty, improving your measurement of *r* or your measurement of *L*? Explain your choice in one sentence.