**Assignment 1 (21508508)**

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| Question | 1 | 2 | 3 | 4 | 5 |
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**Instructions**

PHYS 156.3 Assignment 1. For all questions, assume given numerical values have a minimum of 3 significant figures. Submit all answers to all questions in WebAssign. Submit detailed solution for question 4 in Canvas. We will accept submissions for grading until 11:59 pm. Any assignments submitted after this time will receive a grade of zero.

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**1.**     Question Details                                                            Hookes law 1pt [53

The force constant of a spring is 159 N/m.

Find the magnitude of the force required to stretch the spring by 7.48 cm from its unstretched length.

[        ] ✘  N

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**2.**     Question Details                                                            SerPSE10 15.2.OP.003. [40

In an engine, a piston oscillates with simple harmonic motion so that its position varies according to the expression

$$x = 6.00 \cos\left(3t + \frac{\pi}{5}\right)$$

where $x$ is in centimeters and $t$ is in seconds.

(a) At $t = 0$, find the position of the piston.

[        ] ✘  cm

(b) At $t = 0$, find velocity of the piston.

[        ] ✘  cm/s

(c) At $t = 0$, find acceleration of the piston.

[        ] ✘  cm/s$^2$

(d) Find the period and amplitude of the motion.

period   [        ] ✘  s

amplitude [        ] ✘  cm

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**3.**     Question Details                                                            SerPSE10 15.5.OP.019. [40

Two high precision pendulums move through their equilibrium positions once each second, so that the periods of each precisely 2.000 s. One of them is in Stockholm, Sweden and has a length of 0.99542 m. The other is in Kuala Lumpur, Malaysia and has a length of 0.99052 m. What is the ratio of the free-fall acceleration of gravity $g$ at these two cities? your answer to at least 5 decimal places.)

$$\frac{g_{\text{Stockholm, Sweden}}}{g_{\text{Kuala Lumpur, Malaysia}}} = \text{[        ]} \; ✘$$

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**4.**    Question Details                                                                SerPSE10 15.6.OP.028. [40

A metal block with a mass of 8.00 kg oscillates at the end of a vertical spring with a spring constant of $2.60 \times 10^4$ N/r
motion is damped by air resistance, and the damping coefficient is $b$ = 3.00 N · s/m.

(a)  What is the frequency (in Hz) of the damped oscillation?

[          ] ✗  Hz

(b)  By what percentage does the amplitude of the oscillation decrease in each cycle?

[          ] ✗  %

(c)  Over what time interval (in s) does the energy of the system drop to 4.00% of its initial value?

[          ] ✗  s

(d)  **What If?** The atmosphere of Venus is 50 times thicker than that on Earth. If the effect of air resistance on Venu
represented by $b$ = 150 N · s/m, recalculate the answers for parts (a) to (c) for this system if it is set in motion
atmosphere of Venus.

What is the frequency (in Hz) of the damped oscillations?

[          ] ✗  Hz

What is the percentage decrease in amplitude in each cycle?

[          ] ✗  %

What is the time interval (in s) for the energy to drop to 4.00% of its initial value?

[          ] ✗  s

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**5.**    Question Details                                                                SerPSE10 15.3.OP.016. [40

A 45.0-g object connected to a spring with a force constant of 40.0 N/m oscillates with an amplitude of 5.00 cm on
frictionless, horizontal surface.

(a) Find the total energy of the system.

[          ] ✗  mJ

(b) Find the speed of the object when its position is 1.20 cm. (Let 0 cm be the position of equilibrium.)

[          ] ✗  m/s

(c) Find the kinetic energy when its position is 3.50 cm.

[          ] ✗  mJ

(d) Find the potential energy when its position is 3.50 cm.

[          ] ✗  mJ

Assignment Details