Homework Assignment 10

Name_____

due in class Friday, November 11

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[47] Problem 4.53

What is $T_1 - T_2$?

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[48] Problem 5.25 **

What is the time between maxima? Also, what is ω_1 for part (c)?

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[49] Problem 5.30 **

Hand in the computer program and computer plots.

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[50] Problem 5.37 **

Hand in the computer program and computer plot.
Explain the similarities and differences compared to Example 5.3.

[50x] Problem 5.44 **

Express Q in terms of the parameters (m, ω, β).

[50xx] Problem 5.52 *** [Computer]

Hand in the computer program and computer plot.
Compare your results with those of the example.

Name_____

Homework Assignment #11 due in class Friday November 18
Staple this cover sheet in front of your solutions.
Write the requested answers on this sheet, and do the detailed calculations on your own paper.

[50] The problem on the back of the page.
Answer: The time can be written in the form x.xxx sqrt(a/g). What is x.xxx?

_____

[51] Problem 6.7 *
Answer: Explain why the geodesic has the form it does.

_____

[52] Problem 6.8 *
Answer: Explain why.

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[53] Problems 6.10* and 6.20**
No answer is required here.

_____

[54] Problems 6.1* and 6.16**
Answer: Describe the corresponding geodesics if point 1 is on the z axis.
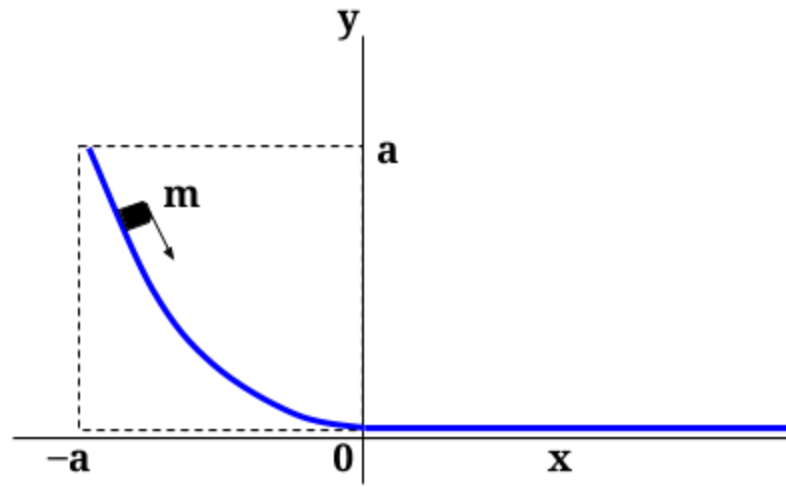
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[55] Problem 6.19 **
Answer: Sketch a picture of the surface.

_____

[56] Problem 6.25 ***
Answer: Explain qualitatively how this surprising result can possibly be true.

[50] A mass m slides without friction in Earth's gravity down the track shown in the figure; the equation for the track is $y = x^2/a$ for $x < 0$ and $y = 0$ for $x > 0$. The initial point is $\{x,y\} = \{-a, a\}$ and the initial velocity is 0.

The energy is $E = \frac{1}{2} m (\dot{x}^2 + \dot{y}^2) + mgy$

(A) Prove that as the mass slides down,

$\dot{y} = -\text{sqrt}(2ga)\ y^{1/2}(1 - y/a)^{1/2}(y + a/4)^{-1/2}$

(B) Calculate the time when the mass passes the point $\{x,y\} = \{0,0\}$.
The time can be written as $t = x.xxx \ \text{sqrt}(a/g)$ where x.xxx is a decimal number. What is the number? (Use Mathematica to calculate the integral.)

Name_____

Homework Assignment #12 due in class Monday November 28

Staple this cover sheet in front of your solutions.

Write the requested answers on this sheet, and do the detailed solutions on your own paper.

[61] Problem 7.2 ★

Answer: Write down a *general solution* of Lagrange's equation.

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[62] Problem 7.3 ★

Answer: Write down the solution with these initial values: $x(0) = A$, $v_x(0) = 0$ and
$y(0) = 0$, $v_y(0) = B$. Prove that the trajectory is an ellipse, and sketch a graph of the trajectory.

_____

[63] Problems 7.8 ★★

Answer: Write general solutions for X(t) and x(t).

_____

[64] Problems 7.14 ★

Answer: The so-called "crude model" does not resemble a real yo-yo at all. In a real yo-yo there
are two radii − the large radius (R) of the sides and the much smaller radius (r) of the axle.
Calculate the acceleration for the real yo-yo and write the result here.

_____

[65] Problem 7.21 ★

Answer: If the the bead is released at time 0 with $r = R/2$ and $dr/dt = 0$, calculate the time when
the bead flies off the end of the rod; R = length of the rod. Write the time here.

_____

[66] Problem 7.31 ★★

Answer: Try to solve the equations with $x(t) = A \exp(i\omega t)$ and $\varphi(t) = B \exp(i\omega t)$. If possible
determine ω.

_____

[67] Problem 7.43 ★★★ [Computer]

Answer: Hand in the computer program and the plots.

Name _____

Homework Assignment #13 due in class Friday December 2

Staple this cover sheet in front of your solutions.

Write the requested answers on this sheet, and do the detailed solutions on your own paper.

[71] Problem 8.4 ★

Answer: Write the equation of motion.

[72] Problem 8.6 ★

Answer: No answer required here.

[73] Problem 8.12 ★★

Answer: Write the equations for ω_θ and ω_r .

[74] Problem 8.15 ★

Answer: By what percent would you expect the "constant" to vary?

[75] Problem 8.16 ★★

Answer: Write the equations for x and y.

Name _____

Homework Assignment #14 due in class Friday December 9.

Staple this cover sheet in front of your solutions.

Write the requested answers on this sheet, and do the detailed solutions on your own paper.

[76] Problem 8.19 ★★

Answer: The height when it crosses the y axis is

_____

[77] Problem 8.25 ★★★

This is a computer problem. Turn in the programs and plots.

Answer: What is r_{min} in part (b)?

_____

[78] Problem 8.27 ★★★

Answer: What are c, ε and δ ?

_____

[79] Problem 8.28 ★

Answer: No answer is required here.

_____

[80] Problem 8.34 ★★

Answer: No answer is required here.

_____

[80x] NASA has sent satellites to the planet Mars. The method is to put the satellite into a Keplerian orbit whose perihelion is at the position of the Earth and whose aphelion is at the position of Mars. The satellite does not travel to Mars under rocket power; it just moves under the influence of the Sun's gravity. Calculate the number of days the trip to Mars will take.

Answer: The number of days is

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Final Exam:
Wednesday, Dec 14 2016
12:45pm - 2:45pm
in 1300 Biomedical & Physical Sciences