Name_____

Homework Assignment 9
due Wednesday, November 1
Cover sheet : Staple this page in front of your solutions, with answers where indicated.

[41] Problem 4.41 and Problem 4.43
(No answer required here.)

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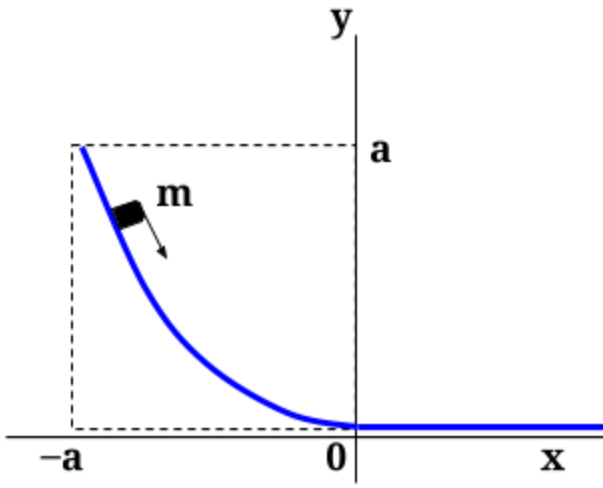
[42] A mass m slides without friction in Earth's gravity down the track shown in the figure; the equation for the track is $y = x^2/a$ for $x < 0$ and $y = 0$ for $x > 0$. The initial point is $\{x,y\}=\{-a, a\}$ and the initial velocity is 0.
(A) Calculate dy/dt when the height is y, in the form $dy/dt = f(y)$.
(B) Calculate the time when the mass passes the point $\{x,y\}=\{0,0\}$.



Answer: The time in part (B) is ...
1.874 SQRT[a/g] (3 points)

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[43] Problem 5.3.*
Answer: The parameter k is ... $k = m\,g\,l$ *(1 point)*

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[44] Problem 5.5.*
Answer: Express C in terms of B_1 and B_2 ... $C = B_1 - i\,B_2$ *(1 point)*

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[45] Problem 5.9.*
Answer: The period is ... $\tau = 1.047$ *s (1 point)*

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[46] Problem 5.12.**
(No answer is required here.)

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[47] Problem 5.18.*** *Assume $a < l_0$. Show that $\{x,y\}=\{0,0\}$ is an unstable equilibrium, and explain why. (3 points)*
The potential energy is $kx^2 + k\,(a - l_0)\,y^2/a$. If $a < l_0$ then the coefficient of y^2 is negative; i.e., $y = 0$ is an unstable equilibrium. ***Explain why****: if the springs are compressed ($a < l_0$) then the mass will move to + or − y to release the compressions.*