Name:	Signature:
Surname:	Number:

KOÇ UNIVERSITY

College of Sciences

PHYS 101 General Physics 1

Fall Semester 2015

Midterm2 Exam

December 1st, 2015 Tuesday, 19:00-21:00

Please read.

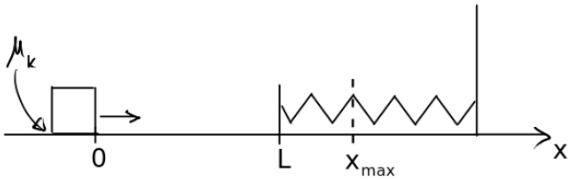
- Count to make sure that there are 5 pages in this question booklet
- Check your **name, number, on front page, and student ID on each page.**.
- This examination is conducted with closed books and notes.
- Put all your personal belongings underneath your seat and make sure that pages of books or notebooks are not open.
- Absolutely no talking or exchanging anything (like rulers, erasers) during the exam.
- You must show all your work to get credit; you will not be given any points unless you show the details of your work (this applies even if your final answer is correct).
- Write neatly and clearly; unreadable answers will not be given any credit.
- If you need more writing space, use the backs of the question pages and put down the appropriate pointer marks.
- Make sure that you include units in your results.
- Make sure that you label the axis and have units in your plots.
- You are not allowed to use calculators during this exam.
- Turn off your mobile phones, and put away.
- You are not allowed to leave the class during the first 15 minutes, and last 15 minutes.
- Write your final answers into the boxes. No points will be given to unjustified answers. Incomplete calculations will not be graded.

P101_Index:

1	2	3	4	Total

Exam Room:	P101_Index:
Student ID Number:	Signature:

1 (25 pts) A 1.0 kg block moves on a rough surface with a coefficient of kinetic friction 0.50 N/m, towards an ideal spring. Initially (at $x=0$) the block has a speed of 4.0 m/s and it is a distance L away from the spring. Assume $g = 10 m/s^2$.



a) (6 pts) The speed of the block is reduced to 2.0 m/s by the time it reaches the spring. Find the work done by the frictional force in the interval $0m \le x \le L$.

$W=$

b) (6 pts) Find L.

$L=$

c) (7 pts) After compressing the spring and bouncing back, the block comes to rest at $x = L$. Find the maximum distance, x_{max}, reached by the block.

$x_{max}=$

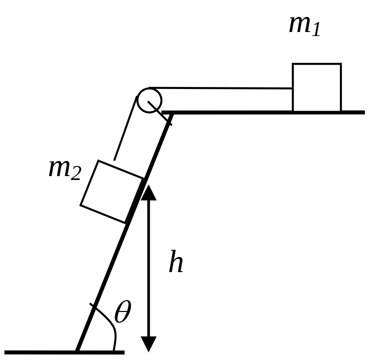
d) (6pts) Find the work done by the spring while the block compresses the spring from $x = L$ to $x = x_{max}$.

$W=$

 Solution continues on the back side of the page **Yes** □ **No** □

Exam Room:	P101_Index:
Student ID Number:	Signature:

2-(25points) Two small blocks of equal mass (m_1=m_2=m) are connected by an ideal string through a frictionless massless pulley as shown in the figure. m_2 on an inclined surface, at a height h above the ground. The inclined surface makes an angle θ with the ground. The coefficient of kinetic friction between the blocks and the surfaces is μ_k. Suppose that the system is released from rest and the block on the inclined surface moves down and stops when it hits the ground floor.



a) Calculate the work done by the gravitational force.

W=

b) Calculate the kinetic energy of m_2 just before it hits the ground.

K=

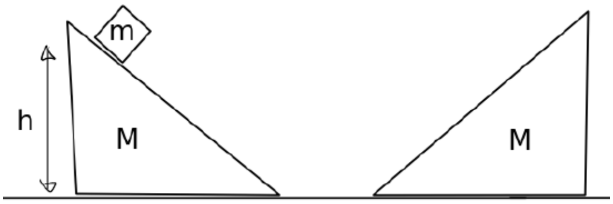
c) Calculate the length of the path that m_1 has moved until it has stopped.
(Assume that m_1 does not reach to the pulley until it has stopped.)

x=

Solution continues on the back side of the page **Yes** □ **No** □

Exam Room:	P101_Index:
Student ID Number:	Signature:

Q3 (25 pts) A box with mass *m* is released at a height *h* from the top of a wedge with mass $M=2m$. A second, identical wedge is placed facing the first, as shown. All objects are initially at rest and all surfaces are frictionless. Give your answers in terms of *m*, *h*, and the downward gravitational acceleration *g*. You may neglect the size of the box.



a) (8 pts) Find the speed *v* of the box when it first reaches the ground.

v =

b) (8 pts) Find the maximum height h' the box climbs up the right wedge.

h' =

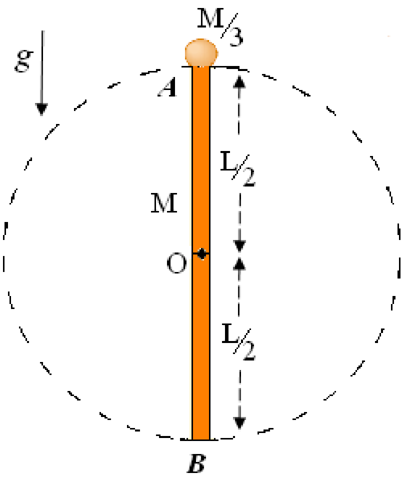
c) (9 pts) Find the speed v' of the box after it detaches from the right wedge.

v' =

Solution continues on the back side of the page **Yes** □ **No** □

Exam Room:	P101_Index:
Student ID Number:	Signature:

4-(25 Points) A uniform rod of length L and mass M has a small ball of mass M/3 fastened to one end. The rod is free to rotate in a vertical plane about a frictionless axis passing perpendicularly through its midpoint O. The system (rod+small ball) is initially held at rest in the vertical position as shown in the figure. It is then given a small push and set into counterclockwise rotation.



a) Using integration calculate that the moment of inertia of the rod (without the small ball) about an axis through its midpoint O is $ML^2/12$.

I_{rod} = =

b) Find the moment of inertia of the system (rod+small ball).

I_{system} =

c) Using energy conservation find the angular speed of the system (rod+small ball) when it reaches the point B. What is the linear speed of the small ball at this instant?

$\omega =$

v =

d) What is the direction of the angular velocity vector?

Direction:

Solution continues on the back side of the page **Yes** □ **No** □