Name, Surname:	Signature:
Exam Room:	Student ID Number:

PHYS 101 General Physics I – Midterm 1

16 March 2019 Saturday 10:00 -12:00

Please read!

- Count to make sure that there are 5 pages in the question booklet
- Check your name and surname on front page, and student ID number on each page, and sign 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 allowed to use calculators during this exam.**
- Only the answers in the boxes will be graded and NO partial credit will be given. No points will be given to unjustified answers. Incomplete calculations will not be graded

P102_Index:

1	2	3	4	TOTAL

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1) a) (10 Points) What is the angle between $\vec{A} = -3\hat{\imath} + 4\hat{\jmath} + 2\hat{k}$ and $\vec{B} = 2\hat{\imath} - 3\hat{\jmath} + 5\hat{k}$?

α =

b) (10 Points) Consider the vectors $\vec{A} = 2\hat{\imath} + 3\hat{\jmath}$ and $\vec{B} = x\hat{\imath} + 2\hat{\jmath}$. What is x if $\vec{A}$ and $\vec{B}$ are perpendicular to each other?

X =

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

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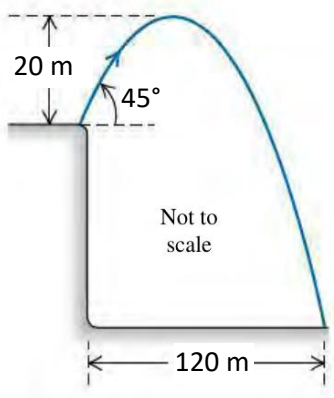
2) (20 Points) A grasshopper leaps into the air from the edge of a vertical cliff, as shown in Figure below. Find (a) the initial speed of the grasshopper and (b) the height of the cliff. (Assume $g = 10\ \mathrm{m}/s^2$)



V =

h =

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

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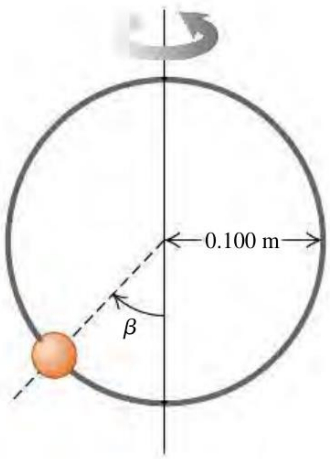
3) (20 Points) A small bead can slide without friction on a circular hoop that is in a vertical plane and has a radius of 0.1 m as shown in the Figure below. The hoop is in vertical equilibrium for when the angle β is equal to $45°$. Find the linear speed (v) and angular speed (ω) of the bead. (Assume $g = 10\ \mathrm{m}/s^2$)



v =

ω =

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

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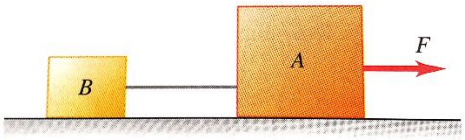
4) (20 Points) Two blocks connected by a light horizontal rope sit **at rest** on a horizontal, frictionless surface. Block **A** has mass **15 kg** and block **B has mass m**. A constant horizontal force **F= 60 N** is applied to block **A**. In the first **5 sec** after the force is applied, block A moves **25 m** to the right.



a) While the blocks are moving, what is the **tension T** in the robe that connects the two blocks?

T =

b) What is the **mass of block B**

m =

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

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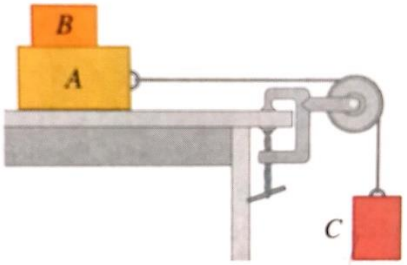
5) (20 Points) Block **B**, with mass **5 kg** rests on block **A**, with **7** kg , which in turn is on a horizontal tabletop. There is no friction between block A and the tabletop, but the coefficient of static friction between blocks A and B is μ=0.6. A light string attached to block A passes over a frictionless, massless pulley and block **C** is suspended from the other end of the string. What is the **largest mass that block C** can have so that **A and B still slide together** when the system is released from rest? (g=10 m/s^2)



M =

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