General Physics 1 Name:_____

Fall 2018 Student ID:_____

Istanbul Medipol University
School of Engineering and Natural Sciences
General Physics 1 Midterm 1

November 17, 2018

Name	
Student ID	
Signature	

- Write your name and student ID on every page in the spaces provided above.
- *Show all your work*. Your work and answers must be shown on the pages provided.
- Your grade will be based on the correctness of your solution and the clarity of your work leading up to the solution.

Question	Points Earned
1 (25)	
2 (25)	
3 (25)	
4 (25)	
Total	

Question 1

The position of a particle is given as a function of time as $\vec{r} = \left(4t^2\hat{i} - 8t\hat{j}\right)$ meters.

a) Find the displacement vector $\Delta\vec{r}$ of the particle between $t = 1$ and $t = 4$ seconds.

b) Find the average velocity vector $\vec{v}_{avg}$ of the particle between $t = 1$ and $t = 4$ seconds.

c) Find the angle between the average velocity vector $\vec{v}_{avg}$ of the particle and the *x*-axis between $t = 1$ and $t = 4$ seconds.

d) Find the instantaneous velocity $\vec{v}$ of the particle at $t = 2$ seconds.

e) Find the instantaneous acceleration $\vec{a}$ of the particle at $t = 5$ seconds.

Question 1

Question 2

Joe starts from rest and finishes a 150 meter race in 18 seconds. For the first 30 meters, he runs with constant acceleration and then with constant velocity.

a) How long does it take for him to run the first 30 meters?

b) How long does it take for him to run the last 120 meters?

c) What is his final velocity?

d) What is his acceleration in the first 30 meters?

Mary is in the race. She starts from rest at the same time and runs with constant acceleration of 0.75 m/s^2.

e) Who wins the race?

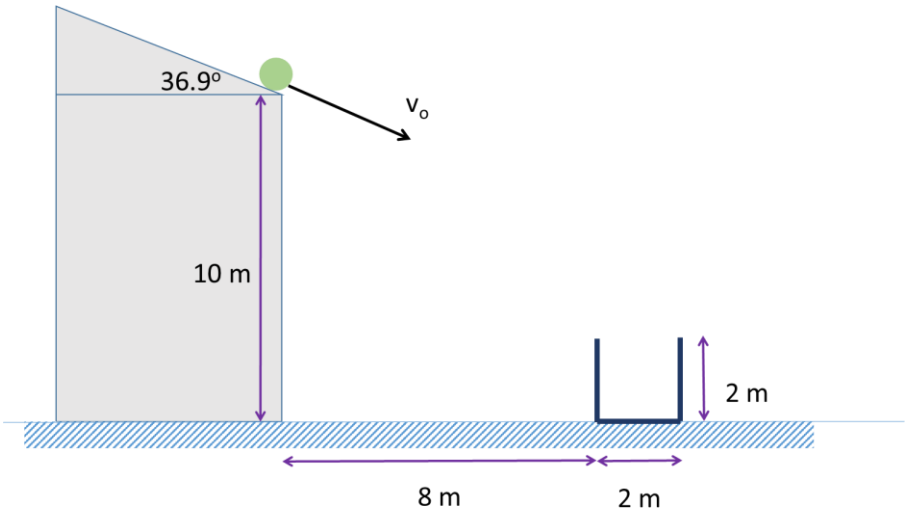
f) At time t = 6 seconds, what is Mary's velocity relative to Joe?

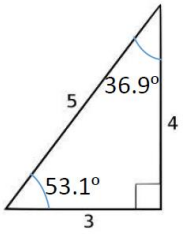
Question 2

Question 3

For a ball sliding off the roof with initial velocity v_0 as shown, find the range of initial velocities (v_0) for which the ball enters the container on the street. (Assume g = 10 m/s^2)

(You can leave answers as square root and fractions)





Question 3

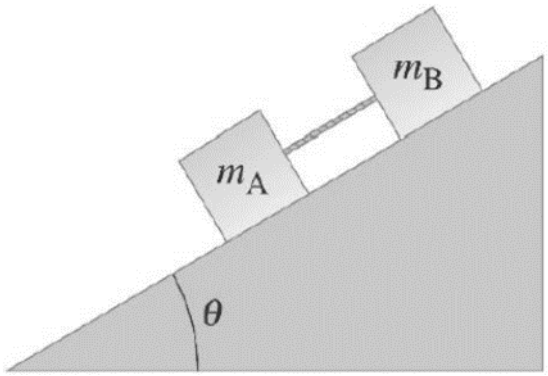
Question 4

Two blocks of equal mass $m_A = m_B = m$, connected by a massless cord of fixed length, slide down a plane ramp inclined at an angle θ to the horizontal as shown in the figure. The coefficient of kinetic friction between block A and the inclined surface is $\mu_A = \mu$, whereas the coefficient of kinetic friction between block B and the inclined surface is $\mu_B = 2\mu$.

a) Draw a free body diagram for each block.

b) Find the acceleration of the blocks in terms of m, μ, θ and the gravitational acceleration g.

c) Find the tension in the cord in terms of the above-mentioned parameters.



Question 4