Physics 1100 (SP17) Exam1b, Name____________________________, ID#________________, Score_____

1. (**1D Kinematics**) An unidentified flying object (UFO) flies from the Manhattan Beach to Brooklyn College along the Ocean Avenue. It flies for 3000 m arriving at Ave. Z with a constant speed of 10 m/s. It then accelerates its speed from Ave. Z to Ave. M at which the UFO's speed is 100 m/s. From Ave. M to Brooklyn College, the UFO's speed decreases to zero when it arrives at Brooklyn College, traveling another 3000 m.
   (a) How long it takes for the UFO to fly from Manhattan Beach and Ave. Z? Ans. __3000/10 = 300 s
   (b) What is value of acceleration from Ave. Z to M if the distance between the two avenues is 6000 m? Ans.0.825m/s^2
   (c) How long does the UFO fly from Ave. Z to Ave. M? Ans.________109 s
   (d) What is the value of de-acceleration between Ave. M and Brooklyn College? Ans. ___1.67 m/s^2
   (e) How long does the UFO fly from Ave. M to Brooklyn College? Ans.___60 s
2. (**2D kinematics**) As shown in Fig.3, an object is launched from a 60-m hill top with a speed of 25 m/s in an angle of 45 degree from horizontal and lands on the ground. Use g = 10 m/s^2 for this and following problems.
   (a) What is horizontal initial launching speed? Ans. ____17.7 m/s
   (b) How long does the object take to reach to the maximum height? Ans.________1.77 s
   (c) What is the maximum height the object can reach above the ground? Ans. _____75.63 m
   (d) How far horizontally the object can reach away from the hill when it lands? Ans.___100 m
   (e) What is the vertical component of the velocity just before the object hits the ground? Ans. __38.9 m/s
   (f) What is the horizontal speed just before it hits the ground? Ans. ______17.68 m/s
   (g) What is the magnitude of object's final velocity just before it hits the ground? Ans. ____42.73 m/s

3. (**Newton's Laws, gravitation, normal force, and friction force**) As shown in Fig.1, two objects (M, m) are connected by a rope. M = 100 kg, m = 40 kg, and $\theta = 30^o$. The dynamic friction coefficient between the slope surface and object M is 0.01. Find:
   (a) Normal force on object M? Ans.___866 N_____ (indicate the direction on Fig. 1)
   (b) Dynamic friction force on the object M? Ans. _____8.66 N____(indicate the direction on Fig. 1)
   (c) Gravitational force on the object M? Ans. _____1000 N____ (indicate the direction on Fig. 1)
   (d) The acceleration of object M? Ans. ___0.65 m/s^2_____ (indicate the direction on Fig. 1)
   (e) The acceleration of object m? Ans.____0.65 m/s^2_____ (indicate the direction on Fig. 1)
   (f) The value of tension in the rope? Ans.________426 N

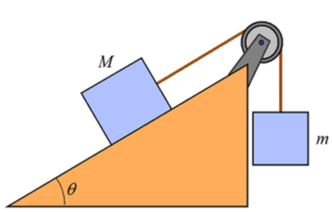

Fig. 1

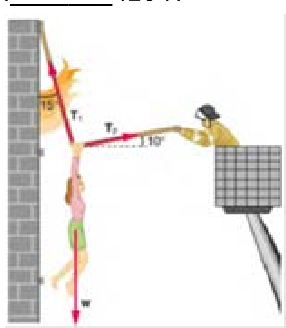
Fig.2

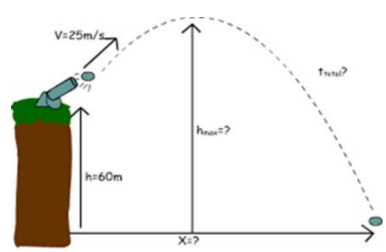

Fig.3

4. (**Newton's Laws, tension**) A 50-kg person is being pulled away with a constant speed from a burning building as shown in Fig.2. Find (a) the tension T_1 in left rope, Ans. __792 N___ (b) the tension T_2 in right rope, Ans. __208 N

Kinematics (a = 0)	$x = v_0 t$		
Kinematics (a ≠ 0)	$v = v_0 + at$	$x = x_0 + v_0 t + (1/2)at^2$	$v^2 = v_0^2 + 2a(x - x_0)$
Newton's Laws	$\mathbf{V_0}$ remains with $\mathbf{F_{net}} = 0$	$\mathbf{F_{net}} = m\mathbf{a}$	$\mathbf{F_1} = -\mathbf{F_2}$