PHYS 2325 - Dr. Honan - Test 2 - B   Name _____

Possibly Useful Information: $g = 9.80\text{m/s}^2$

Problem 1   Multiple Choice (3 points each)

_____ [i] A 150 lb person stands in an elevator that moves downward and has an upward acceleration of g/3. What is the normal force of the floor on the person?
   (a) 50 lb (b) 100 lb (c) 150 lb (d) 200 lb (e) 250 lb (f) none of the above

_____ [ii] The coefficients of kinetic and static friction between a 1000 lb refrigerator and the floor are 0.55 and 0.65 . If when at rest the refrigerator is pushed with a horizontal force of 600 lb then what is the force of friction between the refrigerator and floor? (a) 500 lbs (b) 550 lbs (c) 600 lbs
(d) 650 lbs (e) 1000 lbs (f) 1200 lbs (g) none of the above

_____ [iii] A 1200 lb weight is held the pulley arrangement shown. If all the pulleys are ideal, then what is the force of the rope pulling up on the floor?
(a) 200 lbs (b) 240 lbs (c) 1200 lbs (d) 6000 lbs (e) 7200 lbs (f) none of the above
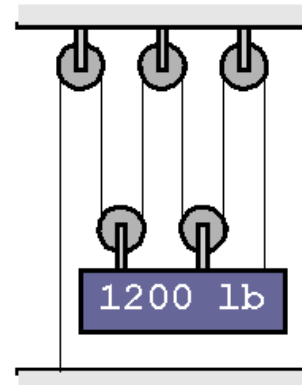
Problem 2   Short answer (2 points each)

A car brakes while rolling down a hill in neutral with an increasing speed. Specify whether the following quantities are positive, negative or zero. (Answer positive, negative or zero.)

_____ [i] ΔK _____ [ii] ΔU _____ [iii] $\Delta U + \Delta K$

Problem 3 (7 points each)
(a) An astronaut with an earth weight of 150 lbs stands on the rim of a rotating space station with a radius of 250m. If the rim of the station rotates with a speed of 30 m/s, then what is the artificial weight of the astronaut in lbs?

(b) A penny sits on a rotating disk that rotates once every 0.9 s. The coefficients of static and kinetic friction between the penny and disk are 0.58 and 0.48, respectively. For the penny to not slide, what is its largest distance from the center of the disk?

Problem 4 A weight W hangs from two strings as shown. What are both tensions? (8 points)
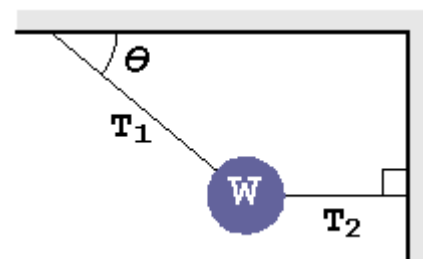
Problem 5 (7 points each)

(a) Junior drops a 50 gram object onto a vertical spring from a height 30 cm above the spring. If the object compresses the spring a maximum distance of 10 cm, then what is the spring constant of the spring

(b) What is the angle between $\bar{A} = \langle 3,12,-4 \rangle$ and the positive z-axis?

Problem 6 A 5 kg mass is pulled up a 32° incline by a rope parallel to the incline. The coefficients of static and kinetic friction between the incline and mass are 0.58 and 0.48, respectively. What tension is needed to slide the mass up the incline at a constant *speed* of 2 m/s? (6 points)

Problem 7 (7 points each)

(a) A single conservative force of $F(x) = 5\,x - 3$ (in SI units) acts on a 0.5 kg particle moving in one dimension. If at $x = 0$ the particle has a speed of 3 m/s, then what is its speed at $x = 2$ m?

(b) A banked turn is designed so that in a perfectly frictionless situation a car can make a 200 m radius turn while driving at a speed of 30 m/s without skidding. What is the angle of incline (measured from horizontal) of the banked turn.

(c) The engine of a 1500kg car does 30000J of work while the car drives *down* a 4m high hill. If the car's speed increases from 10m/s to 14m/s, what is the work done by friction?

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Problem 8 (8 points each)
(a) A 60N crate is dragged 7m on a horizontal surface by a rope pulling with a tension of 85N at an angle of 25° above horizontal. There is a friction force of 55N acting backward on the crate. There are four forces acting, tension, friction, the normal force and gravity. What is the work done by each force?

(b) A puck slows from 40m/s to 35m/s while sliding 130m on a horizontal ice surface. What is the coefficient of kinetic friction between the ice and the puck?

Problem 9 Assuming no friction and ideal pulleys, what is the downward acceleration of m_2 in the diagram? (8 points)
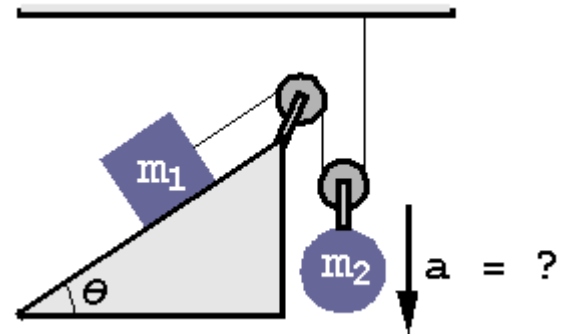
Problem 10 A 50gram mass moves in a vertical circle at the end of a 0.7m long string. The mass is pushed to a speed of 4m/s at the bottom. What is the tension in the string at the bottom just after the mass is pushed? (7 points)