

Name _____ Section _____

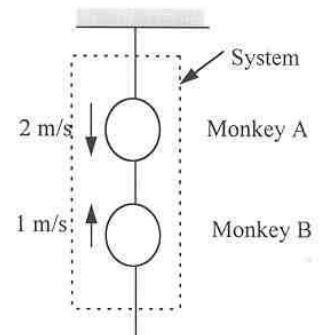
ES201
Examination II
January 23, 1998

Problem	Score
1	/20
2	/30
3	/20
4	/30
Total	/100

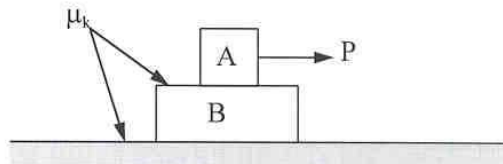
Show all work for credit
AND
Turn in your signed help sheet

- a) The position of a particle is given by $s = 5t^2 + 3t - 8$ m. What is the velocity of the particle when $t = 1$ s.
- b) A force acts on a particle giving it an acceleration, $a = 3x^2$. What is the velocity of the particle when $x = 1$ m.
- c) An elevator and its passengers weighs 3220 pounds ($m = 100$ slugs). Assuming that the elevator is supported by four cables, what is the tension in each cable after the elevator starts to move up at 5 m/s^2 ?

- d) Two 5 kg monkeys are climbing on a rope as shown. Monkey A is traveling at 2 m/s down and monkey B is traveling at 1 m/s up. What is the linear momentum of the system at this instant?



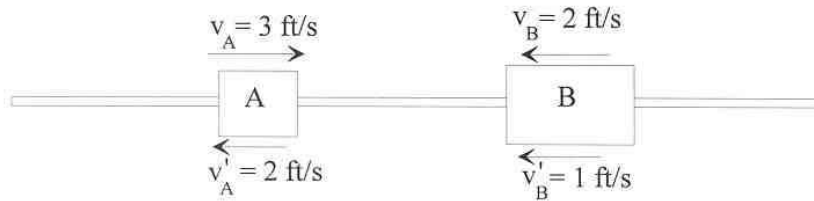
- e) For the blocks shown below having masses m_A and m_B draw a free body diagram of object B labeling all the unknown quantities.



FBD

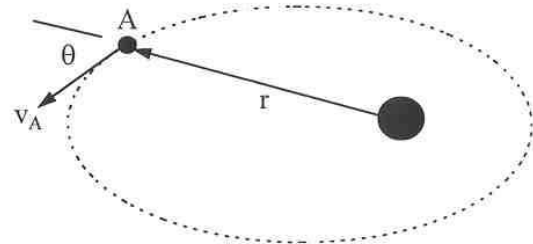


- f) An impact occurs as shown below (the primes denote the velocities after the impact). If B has a mass of 10 kg what is the average impulse between the two objects during the impact?

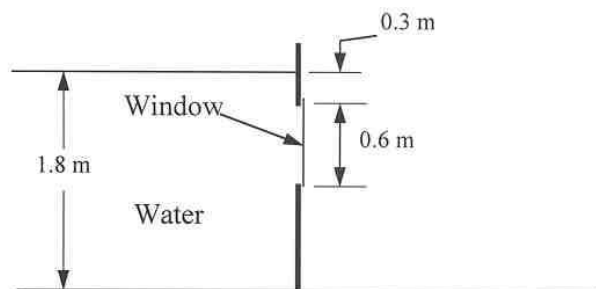


- g) What is the mass of object A in problem 1f)?

- h) The planets rotating about the sun can be considered particles for the purpose of many orbital mechanics calculations. What is the angular momentum of the planet A (assume the planet has a mass m) about the sun for the position shown below.



- g) An aquarium has a 0.6 m by 5 m view window as shown below. What is the magnitude of the resultant force due to the water acting on the window. $\gamma_{H_2O} = 9.81 \text{ KN} / \text{m}^3$

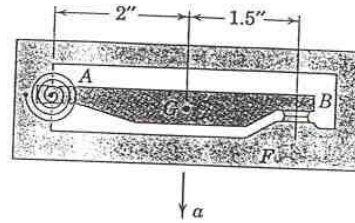


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Problem 2

Jan. 23, 1998
30 pts

Arm AB of a classifying accelerometer has a weight of 0.25 lbf with a mass center at G had is pivoted freely to the frame F at A. The torsional spring at A is set to preload the arm with an applied-clockwise moment of 2 lb-in. Determine the downward acceleration a of the frame at which the contacts at B will separate and break the electrical circuit.



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Problem 3

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40 pts

A test vehicle designed for impact studies has a mass of 1400 kg and is accelerated from rest by the impingement of a high-velocity water jet upon its curved surface as shown. The water leaving the water supply has velocity of 150 m/s and a mass flow rate of 4500 kg/s. Friction acting on the vehicle, which can be treated as a particle, is assumed to be a constant 1000 N. Determine:

- a) the initial acceleration of the vehicle (35 pts)
- b) the velocity of the vehicle after 3 seconds (5 pts)

