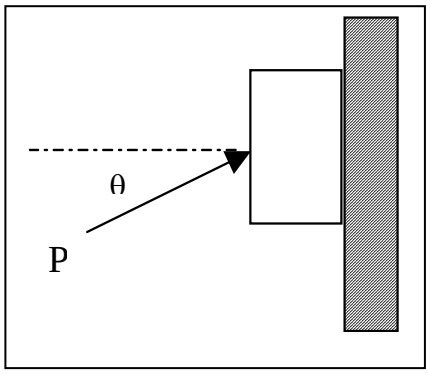
Name: _____

PHY 105 Test 2 November 3, 2004 50 minutes

La Salle University
Dr. R. DiDio

Do all work in the blue book! If you use your calculator to answer a question, briefly describe how. All answers must be in MKS units unless otherwise specified.



1. A force P pushing at an angle θ moves a block of mass m up a wall. There is no friction present and the block has an initial velocity of zero. **[24 pts]**

a) Carefully draw and label a free-body diagram of the block, including appropriate axes.

b) Assuming that the mass accelerates upward, calculate this acceleration in terms of m, g, P, and θ. Comment on your answer: are the units correct, and does it predict the correct behavior as the parameters in the expression are varied?

c) If the mass moves upwards a distance h, calculate the work done by each force acting on the mass.

d) Use an energy approach to determine the velocity of the block after moving up a distance h. You must define your system, and justify your choice of approach (i.e. Word-Kinetic Energy Theorem vs. Conservation of Mechanical Energy)

2. A 2.4 kg mass is attached to the end of a spring with spring constant 15 N/m. The other end of the spring is connected to a pole about which it is free to rotate. The mass is then set in circular motion in a horizontal plane, with the mass riding on a frictionless surface. If the unstretched length of the spring is .8 m, and the spring stretches by 0.4 m when the block rotates in a circle, what is the speed of the block? [**10 pts**]

3. A block of mass 0.25 kg moving in the *x*-direction is acted upon by the varying force $F(x) = 4 - 3x^2$ N, where *x* is in meters. [**12 pts**]

a) Calculate the total work on the block as it moves from x = 1 m to x = 4 m.

b) If the velocity of the mass is 20 m/s at x=4 m, what was the velocity at x=1?

4. A 2.5 kg block travels down a 33° incline. The length of the incline is 1.4 m. Because of friction, the acceleration of the block is only 90% of the acceleration it would have if friction were not present (i.e. g sin(θ)) [**18 pts**]

a) Use kinematics to calculate the velocity of the block at the bottom of the incline.

b) Using your answer in (a) and an energy approach, determine the increase in internal energy of your system. (Note: You must define your system and justify your energy approach!)

c) Use your answer from (b) to calculate the coefficient of friction.

5. In the following setup, define a system such that mechanical energy is conserved. Explain your choice, and why mechanical energy is conserved in this case. [**6 pts**]