EXAM II Physics 218 2015

Last Name.....First Name.....Section Number.....

USEFUL INFORMATION

$$If \quad f(x) = kx^n \qquad \frac{df}{dx} = nkx^{n-1}$$

$$If \quad f(x) = kx^n \qquad \int_A^B f(x)dx = \frac{1}{n+1}k(B^{n+1} - A^{n+1})$$

$$If \quad f(x) = kx^n \qquad \int f(x)dx = \frac{1}{n+1}kx^{n+1} + C$$

$$\int_{\vec{r}_1}^{\vec{r}_2} \vec{F}_{tot} \cdot d\vec{r} = \frac{1}{2}mv^2(\vec{r}_2) - \frac{1}{2}mv^2(\vec{r}_1)$$

If $\vec{F}$ is conservative:

$$\int_{\vec{r}_1}^{\vec{r}_2} \vec{F} \cdot d\vec{r} = -[U(\vec{r}_2) - U(\vec{r}_1)]$$

and

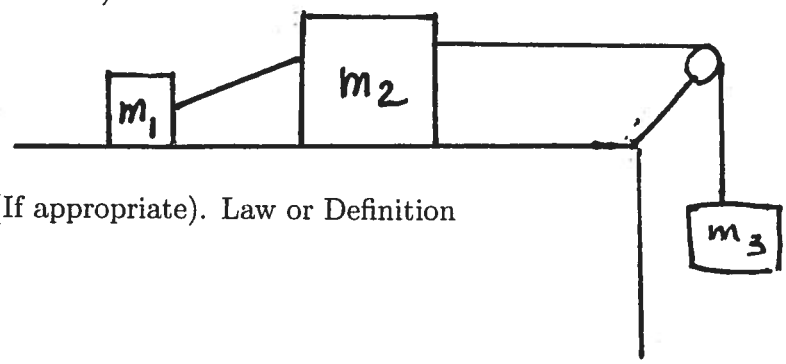
$$F_x = -\frac{\partial U}{\partial x} \qquad F_y = -\frac{\partial U}{\partial y}$$

1.

2.

3.

1. (33 points)Two masses are connected by a massless, unstretchable rope which makes an angle θ with the horizontal. The masses are connected by another massless, unstretchable rope to a third mass. The pulley is frictionless. The two blocks slide to the right on a surface where there is friction with coefficient of friction μ. Obtain a sufficient number of equations that **could** be solved for the tensions in the two ropes. (All masses and θ are known.)



Free Body Diagrams (If appropriate). Law or Definition

Application

2. (33 points)A small block of mass m is to start at the point marked $x = A$ with velocity of magnitude v_1 to the right. The coefficient of friction between the block and the plane is μ. A **horizontal** force $\vec{P}$, which acts to the left is applied to the block. The force has magnitude $\frac{\beta}{x^2}$ where β is a known constant. What must v_1 be in order for the block to stop at $x = 2A$?

Free Body Diagrams (If appropriate). Law or Definition

Application

Result

3. (34 points) A small object of mass, m, moves along the positive x axis. One force acts on it which points to the right and has magnitude βx^3 where β is a known positive constant. A second force has known, constant magnitude P and always points to the left. A third force acts on the object in the x direction but it is unknown. The object is started at $x = 0$ with velocity v_1 to the right. The kinetic energy of the object is measured and found to be a function of x given by $\frac{1}{2}mv_1^2 + c_1x^2$ where c_1 is a known constant. Given that the unknown force is conservative, find its potential energy function and determine the unknown force. Determine whether or not the other two forces are conservative.

Free Body Diagram (If appropriate). Law or Definition

Application

Result