Homework 5

Due Tuesday 2/27/2009

Fowles Problems

1.18

2.12

2.14

3.10

4.20

4.21

Problem E.1 An oscillator is overdamped such that the damping constant is twice the critical damping constant. Write the trajectory of the oscillator in terms of the natural angular frequency. The oscillator is released with amplitude A.

Problem E.2 Consider the force

$$\vec{F} = \frac{\hat{e}_\theta}{r}$$

expressed in spherical coordinates where θ is the angle that $\vec{r}$ makes with the z axis and r is the distance from the origin. Determine whether the force is conservative by evaluating the curl of the force in spherical coordinates.

Problem E.3 An isotropic harmonic oscillator has potential function,

$$V(x, y) = \frac{1}{2}k(x^2 + y^2)$$

where k is the spring constant. The oscillator is confined to the $x - y$ surface. The mass experiencing the restoring force is m. The mass is released from the point $(a, a, 0)$ and brought to a stop at $(-b, -b, 0)$ where a and b are positive constants. The surface has a coefficient of kinetic friction of μ^k. How much work does the force that brings the particle to a stop do?