Quiz 5

1. Test whether the following force is path-independent using $\vec{\nabla} \times \vec{F}$:

$$\vec{F}_{\text{quiz}} = -y\hat{x} \tag{1}$$

2. The gradient of a function f in spherical coordinates is:

$$\vec{\nabla} f = \hat{r}\frac{\partial f}{\partial r} + \hat{\theta}\frac{1}{r}\frac{\partial f}{\partial \theta} + \hat{\phi}\frac{1}{r\sin\theta}\frac{\partial f}{\partial \phi}$$

Fill in the blanks:

$$d\vec{r} = (\qquad)\,\hat{r} + (\qquad)\,\hat{\theta} + (\qquad)\,\hat{\phi}$$

3. Let $U = mgz = mgr\cos\theta$. Find $\vec{F} = -\vec{\nabla}U$