MATH 2415 TEST 4

Name:

Exercise	Point Possible	Score
1	50	
2	50	
Total	100	

1. [50 points] Find the maximum and minimum values of e^{-xy} in the region $x^2 + 4y^2 \leq 1$. (Hint: there's one critical point inside the ellipse, but when restricting to the boundary of the ellipse, you should find four other other points that need to be considered.)

2. [50 points] Consider spherical coordinates:

$$x = \rho \sin\theta \cos\phi$$
$$y = \rho \sin\theta \sin\phi$$
$$z = \rho \cos\theta$$

(a) If an object is moving such that at the moment, $\rho = 50$, $d\rho/dt = 1$, $\theta = \pi/6$, and $d\theta/dt = 0.01$, then what is dz/dt?

(b) If also $\phi = \pi/4$ and $dx/dt = 2$, then what is $d\phi/dt$?