Practice Problems Exam II Math 232, Calculus III, Fall 2016

This is an old exam. It is not exhaustive (meaning that it doesn't cover EVERY question I can ask). Make sure you look through your old quizzes and homework assignments for additional practice.

1. Find the arc length of $\vec{r}(t) = \langle \sin(2t), -2t, -\cos(2t) \rangle$ for $1 \le t \le 4$.
2. The acceleration of a particle is given by $\vec{a}(t) = \langle \cos(t), -3, 3t^2 \rangle$. Find the velocity function $\vec{v}(t)$ if the initial velocity is $\vec{v}(0) = \langle -2, 5, 3 \rangle$.
3. Show that the limit $\displaystyle\lim_{(x,y)\to(0,0)} \frac{2xy}{x^2 + 2y^2}$ does not exist.
4. Evaluate the limit $\displaystyle\lim_{(x,y)\to(0,0)} \frac{xy}{\sqrt{10x^2 + 10y^2}}$ by first changing to polar coordinates.
5. Let $z = yz + x\ln(y)$. Use implicit differentiation to find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$.
6. Find the equation of the tangent plane at $(1, -2, 1)$ to the surface $f(x, y) = 3x^2 + 2x - y^2$. Use the tangent plane to approximate $f(1.1, -1.8)$.
7. Let $f(x, y) = \tan^{-1}(x^2 + y^2)$, $x = s\ln(t)$, and $y = te^s$. Using the chain rule, find $\dfrac{\partial z}{\partial t}$ at $t = 1$ and $s = 0$.
8. Find the directional derivative of $z = x^2 e^{-y}$ at $(3, 0)$ in the direction of $\vec{v} = 3i + 4j$. Determine the max rate of change and in what direction.
9. Find the local maximum, local minimum, and saddle point(s), if any, of $f(x, y) = x^2 - xy + y^2 + 9x - 6y + 10$.
10. Find the local extrema or saddle points, if any, of $f(x, y) = x - y - x^2y + xy^2$.
11. Use Lagrange Multiplies to find the maximum and minimum of $f(x, y) = x^2y$ subject to the constraint $x^2 + y^2 = 1$.
12. Extra Lagrange Problem: Find the maximum and minimum of $f(x, y) = xy$ subject to the constraint $4x^2 + y^2 = 8$.