Math 3330 - Quiz 4

Name:_____

1. Let $f(x,y) = x^3 - 3xy$. Compute $\nabla f(x,y)$ and $\nabla f(1,2)$.

2. Compute the directional derivative of $f(x,y) = x^3 y^2 - x^3$ in the direction of the vector $\mathbf{v} = \langle 1, 3 \rangle$ at the point $(1,2)$.

3. Find the equation of the tangent plane for $f(x,y) = e^{x^2 - y^3} + 3y^2 - x^3$ at the point $(-1,1)$.

4. Let $f(x,y,z) = \sin(2x^2 - y^3) + z^2 x^3$ and P be the point $(-2,2,1)$ and Q be the point $(-2.1, 1.9, 1)$.

   (a) Compute the equation of the tangent plane

   (b) Compute the w value for the plane at the point Q and compute the function value at the point Q and compare.

5. Let $f(x,y) = x^2 + xy - 2x - y^3 - y$. Use the second derivative test to find and classify the extremma.

6. Let $f(x,y) = x^3 - 3xy^2 + 24y$. Use the second derivative test to find and classify the extremma.

7. Find the extremma of $f(x,y,z) = x\ln(x) + y\ln(y) + z\ln(z) + w\ln(w)$ where the values (x,y,z,w) are constrained by $x + y + z + w = 1$.

8. Find the smallest value of $x^2 + y^2 + z^2$ while the sum of x, y and z is equal to 11.