MA104, Calculus I

Homework 3 - Due 15 May 2008, in class - Worth 30 points

Remember your documentation sheet!

1. Find all the first and second partial derivatives and one mixed partial ($f_x, f_y, f_z, f_{xx}, f_{yy}, f_{zz}, f_{xy}$)

   (a) $f(x, y, z) = \sin(2x + 3yz)$

   (b) $f(x, y, z) = x^3 + x^2y^2z^2 - 4y^3$

   (c) $f(x, y, z) = x \ln(2y + 3z)$

   (d) $f(x, y, z) = 3x^3 + ze^{2xy}$

2. Find the gradient of $f(x, y, z) = \sqrt{y^2 + x} + \dfrac{1}{z}$ at the point $(2, 4, 3)$.

3. Find the Directional Derivative of $f(x, y, z) = x + 2yz$, at the point $(2, 4, 3)$, in the direction $\mathbf{v} = \langle 4, -4, 2 \rangle$.

4. If $f(x, y) = xy + \frac{1}{x} + \frac{1}{y}$ find all critical points, classify them, and find the values of the function at the points.

5. Find the points on the cone $z^2 = x^2 + y^2 + 4$ that are closest to the point $(4, 2, 1)$.