Math 496-004 **Assignment # 11** **13 Nov 08**

Due: Nov 19th

1. Do Problem III.3.6 in Edwards (page 194). That is, Can the surface whose equation is

$$xy - y \log z + \sin xz = 0$$

be represented in the form $z = f(x, y)$ near $(0, 2, 1)$?

Of course, you should justify your yes/no answer.

2. Do Problem 6.104 in Schaum's (page 148). That is, Show that $F(x+y-z, x^2+y^2) = 0$ satisfies

$$x\frac{\partial z}{\partial y} - y\frac{\partial z}{\partial x} = x - y.$$

You might want to look at the solution to Problem 6.24.

3. Do Problem III.3.11 in Edwards (page 195). That is, If the equations $f(x, y, u, v) = 0$ and $g(x, y, u, v) = 0$ can be solved for u and v as differentiable functions of x and y, compute their first partial derivatives.

4. Do Problem III.3.17 in Edwards (page 195). That is, Suppose that the pressure p, volume v, temperature T, and internal energy u of a gas satisfy the equations

$$f(p, v, T, u) = 0, \qquad g(p, v, T, u) = 0,$$

and that these two equations can be solved for any two of the four variables as functions of the other two. Then the symbol $\partial u/\partial T$ is ambiguous. We denote by $(\partial u/\partial T)_p$ the partial derivative of u with respect to T, with u and v considered as functions of p and T, and by $(\partial u/\partial T)_v$ the partial derivative of u with respect to T, with u and p considered as functions of v and T, and by With this notation, apply the results of Exercise 3.11 to show that

$$\left(\frac{\partial u}{\partial p}\right)_v = \left(\frac{\partial u}{\partial T}\right)_v \left(\frac{\partial T}{\partial p}\right)_v = \left(\frac{\partial u}{\partial T}\right)_p \left(\frac{\partial T}{\partial p}\right)_v + \left(\frac{\partial u}{\partial p}\right)_T.$$