Chem 309

Problem Set Two

Due Friday, September 10th at end of class

Discussion: D1C.1, D1C.3

Exercises: E1C.3(a), E1C.4(b), E1C.5(b), E1C.9(a),

Problems: P1C.10, P1C.14, P1C.16, P1C.18

Practice Problems on Partial Derivatives

1. Calculate $\left(\frac{\partial z}{\partial x}\right)_y$ and $\left(\frac{\partial z}{\partial y}\right)_x$ for the following functions z.

a) $z = x^2y$

b) $z = 3e^{xy^3}$

c) $z = \ln(x^3y^5 - 2)$

d) $z = e^y \tan(x)$

2) Calculate $\left(\frac{\partial w}{\partial x}\right)_{y,z}$, $\left(\frac{\partial w}{\partial y}\right)_{x,z}$, $\left(\frac{\partial w}{\partial z}\right)_{x,y}$.

a) $w = \sqrt{x+y+z}$

b) $w = 3e^{xy^3}$

c) $w = e^{x+2y+3z}$

3) For a), b), and c) in problem 2, use the inverter to calculate $\left(\frac{\partial x}{\partial w}\right)_{y,z}$.

4) Calculate the four second partial derivatives and show that the two mixed partials are equal.

a) $f(x,y) = x^2y$

b) $w = 3e^{xy^3}$

c) $f(x,y) = \sin(x^2 + y^3)$

d) $f(x,y) = \ln(x^3y^5 - 2)$

5) Use the chain rule to calculate $\frac{dz}{dt}$.

a) $z = xy; \quad x = e^{t^2}; \quad y = e^{3t}$

b) $z = x^2 + y^2; \quad x = \cos t; \quad y = \sin t$

6) Use the chain rule to calculate the indicated partial derivatives.

a) $z = \frac{y}{x}, \quad x = e^r, \quad y = e^s; \quad \left(\frac{\partial z}{\partial r}\right)_s, \quad \left(\frac{\partial z}{\partial s}\right)_r$

b) $z = \sin\left(\frac{y}{x}\right), \quad x = \frac{r}{s}, \quad y = \frac{s}{r}; \quad \left(\frac{\partial z}{\partial r}\right)_s, \quad \left(\frac{\partial z}{\partial s}\right)_r$

c) $z = e^{x+y}, \quad x = \ln(rs), \quad y = \ln\left(\frac{r}{s}\right); \quad \left(\frac{\partial z}{\partial r}\right)_s, \quad \left(\frac{\partial z}{\partial s}\right)_r$