

Chemistry 309

Problem Set Two

Due Friday, September 14, 2018, at the end of class

Because of the length of this assignment, you'll get credit for two homework assignments on completion.

1. Practice Problems on Partial Derivatives (below)
2. Discussion: D1C.1, D1C.3
3. Exercises: E1C.1(a), E1C.3(b), E1C.4(b), E1C.9(a)
4. Problems: P1C.1, P1C.3, P1C.5, P1C.6, P1C.9, P1C.14, P1C.15, P1C.16 (hint: consider using one of the tools for manipulating partial derivatives that we went over at the end of Chapter 1)

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

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

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

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

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

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