MA 213 Worksheet #9

Section 14.3

1 *14.3.31* Find the first partial derivatives of $f(x, y, z) = x^3yz^2 + 2yz$.

2 *14.3.57* Find all second partial derivatives of $v = \sin(s^2 - t^2)$.

3 Verify that the conclusion of Clairaut's Theorem holds. That is, show $u_{xy} = u_{yx}$.
14.3.59 $u = x^4y^3 - y^4$
14.3.61 $u = \cos(x^2y)$.

4 *14.3.69* Find $\dfrac{\partial^3 w}{\partial z \partial y \partial x}$ and $\dfrac{\partial^3 w}{\partial x^2 \partial y}$ of $w = \dfrac{x}{y + 2z}$

5 *14.3.71* If $f(x, y, z) = xy^2z^3 + \arcsin(x\sqrt{z})$, find f_{xyz}. [*Hint:* Which order of differentiation is easiest?]

Additional Recommended Problems

6 *14.3.1* The temperature T (in $^\circ C$) at a location in the Northern Hemisphere depends on the longitude x, latitude y, and time t, so we can write $T = f(x, y, t)$.

(a) What are the meanings of the partial derivatives $\partial T/\partial x$, $\partial T/\partial y$, and $\partial T/\partial t$?

(b) Honolulu has longitude 158° W and latitude 21° N. Suppose that at 9:00 a.m. on January 1 the wind is blowing hot air to the northeast, so the air to the west and south is warm, and the air to the north and east is cooler. Would you expect $f_x(158, 21, 9)$, $f_y(158, 21, 9)$, and $f_t(158, 21, 9)$ to be positive or negative? Explain.

7 *14.3.29* Find the first partial derivatives of $F(x, y) = \int_x^y \cos(e^t)\, dt$.

8 *14.3.77* Verify that the function $u = 1/\sqrt{x^2 + y^2 + z^2}$ is a solution of the three-dimensional laplace equation $u_{xx} + u_{yy} + u_{zz} = 0$.