Homework and Quiz 7

Due Friday, July 10, 2009

Ungraded homework

For practice, you should try:

> Section 15.3, page 924, problems 15, 19, 21, 27, 31, 37, 41, 51, 53, 61, 67.
> Section 15.4, page 935, problems 3, 5, 13, 15.

Of these, section 15.3 is the more important: knowing how to take partial derivatives is a fundamental skill in multivariable calculus. Section 15.4 will be more important in the years to come.

Graded Quiz

The graded quiz contains only a few problems; you should really make sure to do *many* practice problems involving partial differentiation. Only through much practice will you develop the skills you need.

(a) Find both partial derivatives of $f(x, y) = x^3y^2 + 3xy + 2$.

(b) Define a function $f : \mathbb{R}^2 \to \mathbb{R}$ by

$$f(x, y) = (\cos x) \cdot (\sin y)\,.$$

Compute $\dfrac{\partial^2}{\partial x\,\partial y} f(x, y)$, $\dfrac{\partial^2}{\partial y\,\partial x} f(x, y)$, $\dfrac{\partial^2}{\partial x\,\partial x} f(x, y)$, and $\dfrac{\partial^2}{\partial y\,\partial y} f(x, y)$.

(c) Write down a linear approximation near $(x, y) = (0, 0)$ for the function $f : \mathbb{R}^2 \to \mathbb{R}$ given by

$$f(x, y) = \cos\left(ye^x\right).$$

(d) Suppose $f(x, y)$ is a polynomial. Compute

$$\frac{\partial}{\partial x}\frac{\partial}{\partial y} f(x, y) - \frac{\partial}{\partial y}\frac{\partial}{\partial x} f(x, y).$$

(e) Suppose $f : \mathbb{R} \to \mathbb{R}$ is a differentiable function. Define $g : \mathbb{R}^3 \to \mathbb{R}$ by

$$g(x, y, z) = f(x + y^2 + z^3).$$

Compute $\dfrac{\partial}{\partial x} f(x, y, z)$, $\dfrac{\partial}{\partial y} f(x, y, z)$, and $\dfrac{\partial}{\partial z} f(x, y, z)$.