UPDATED GENERAL INFORMATION — NOVEMBER 17, 2008

Here is the eighth assignment, which is due **in your discussion section** on **Tuesday, November 25**. All exercises are taken from the course text.

Page 213 and following:	18, 24(a), 26
Page 221 and following:	4, 10, 18, 28(b, c)

Comments regarding Examination 2

The exam will cover Sections 1.7 – 3.2 of the text, with the exclusions noted below. There will be seven problems, but all of them are (intended to be) relatively short; in many cases, problems have been split in two so that there is more room for writing the answers.

Knowledge of polar-rectangular and cylindrical-rectangular coordinate conversion formulas will be required, and familiarity with the spherical-rectangular conversion formulas will be assumed (although they will be furnished if needed). There will be no questions on the concept of a function or the mathematical definition of a limit, but there may be questions on recognizing the type of a quadric surface (in which case a summary of types will be given) or on which computing a limit using simple principles like those in the online notes. Here is an example of the level of such a limit problem:

Determine if

$$\lim_{(x,y)\to(0,0)} \frac{(x+y)^2+(x-y)^2}{x^2+y^2}$$

exists, and find its value if it does exist.

Problems on computing partial derivatives (first and higher order) for standard sorts of functions like those in the exercise can be expected. None will be more difficult than the following, which is motivated by the physics formula for finding the combined resistance of two resistors in a parallel circuit:

$$z \quad = \quad \left(\frac{1}{x} + \frac{1}{y}\right)^{-1}$$

Here is the level of linear approximation problem that might appear on the exam:

Using partial derivatives, find an approximate value for $f(3.02, 4.01)$ if $f(x,y) = \sqrt{x^2+y^2}$.

There may also be some semi-abstract problems requiring the derivation of formulas involving partial derivatives. Some examples are in the assigned exercises, and another one is as follows: If $y = \sin(x+ct)$ where $c \neq 0$, prove that

$$\frac{\partial^2 y}{\partial x^2} \quad = \quad \frac{1}{c^2}\,\frac{\partial^2 y}{\partial t^2}$$

(this is the 1-dimensional form of the *wave equation* in physics). The material on the Newton-Raphson method in Section 2.4 will **NOT** be covered in the exam. Problems involving the Chain Rule, gradient and directional derivative can also be expected, and the ability to work simple examples will be assumed. However, there will be no problems involving the chain rule of a composite function $f(\,g(\mathbf{x})\,)$ in which either f or g is a vector valued function of more than one variable. There may be a problem involving the relation of the gradient direction to the directions of fastest increase in value, fastest decrease in value, or no change in the value of the given function. At least one problem on finding tangent planes, either by the formula for graphs or the formula for points on level surfaces, can be expected. Knowledge of the concept of a parametrized curve as a vector valued function will be assumed, along with the related concepts of velocity, speed and acceleration. None of the material on Kepler's Laws from Section 3.1 will be covered in the course. A problem on arc lengths for parametrized curves can be expected, but none of the material on curvature in Section 3.2 will be covered; this also applies to the material which follows the introduction of curvature in Section 3.2 of the text.

There will be no proof-like derivations on this exam, but a few simple derivations of equations can be expected.

No electronic computing devices will be necessary, and none will be permitted.