Math 223

Week 3 Homework due Tuesday, September 14

Sections 11.3, 11.4

Section 11.3, problems 3, 29, 31, 33, 45, 64, 71, 73

Hints:

3. As we saw in class, $f_x(a,b)$ can be interpreted as rate of change of $z = f(x,y)$ as x varies from a to $a+h$ and y remains fixed at b. $f_y(a,b)$ has a similar interpretation.

33. Use the formulas on the bottom of page 609.

71. Use Clairaut's Theorem, page 613.

73. You already know how to find the equation of a tangent line to a space curve $r(t) = (x(t), y(t), z(t))$ at the point $r(t_0)$: the equation is $L(t) = r(t_0) + tr'(t_0)$. So all you need to do is parameterize the ellipse in the form of a space curve (clearly $y(t) = 2$ for all t), then find the equation of the tangent line. What is an appropriate value for t_0?

73 again. Can you think of a way to derive the equation of the tangent line using $f_x(1,2)$, where $z = f(x,y) = \sqrt{16 - 4x^2 - 2y^2}$? What is the physical interpretation of $f_x(1,2)$?

Section 11.4, problems 5, 11, 15, 19, 23, 25, 29, 32

Hints:

23. $\Delta z = f(1.05, 2.1) - f(1,2)$, $dz = f_x(1,2)(0.05) + f_y(1,2)(0.1)$.

29. Use $dw = \pm .02w$ and $dh = \pm .02h$. Then percentage error in S is $100\frac{ds}{S}$, which should work out to a number after you reduce the fraction. Note that you are not told what numerical values w and h have, and you don't need them to answer the question.

32. The tangent vectors $r_1'(0)$ and $r_2'(1)$ lie in the tangent plane, therefore their cross product $r_1'(0) \times r_2'(1)$ forms a vector which is perpendicular to the tangent plane which you can use to derive the equation of the tangent plane. Why are we using $t = 0$ and $u = 1$?