

WRITTEN HOMEWORK #2, DUE 1/20/2012 AT 4PM

You may turn this assignment at the homework boxes on the bottom floor of Kemeny or at the beginning of class on Friday. Please staple your assignment before turning it in. Remember that you need to provide correct and reasonably complete details to receive full credit. The problems are taken from the 7th edition of Stewart's *Calculus*, although occasionally a problem will be modified to be slightly different from its textbook counterpart.

- (1) (Problem #72, Chapter 14.3) If $g(x, y, z) = \sqrt{1+xz} + \sqrt{1-xy}$, find g_{xyz} . (The book's hint: use a different order of differentiation for each term if you want to keep calculations simple.)
- (2) (Problem #42, Chapter 14.4) Suppose you need to know an equation of the tangent plane to a surface S at the point $P(2, 1, 3)$. You don't have an equation for S but you know that the curves

$$\mathbf{r}_1(t) = \langle 2 + 3t, 1 - t^2, 3 - 4t + t^2 \rangle, \mathbf{r}_2(u) = \langle 1 + u^2, 2u^3 - 1, 2u + 1 \rangle$$

both lie on S . Find an equation of the tangent plane at P .

- (3) (Problem #62, Chapter 14.6) Show that the pyramids cut off from the first octant by any tangent planes to the surface $xyz = 1$ at points in the first octant must all have the same volume.
- (4) (Problem #4, Chapter 15.1)
 - (a) Estimate the volume of the solid that lies below the surface $z = 1 + x^2 + 3y$ and above the rectangle $R = [1, 2] \times [0, 3]$. Use a Riemann sum with $m = n = 2$ and choose the sample points to be the lower left corners. (Even though you can answer this question exactly, that's not what we're looking for – this problem is to give you an idea of how one can numerically approximate integrals.)
 - (b) Repeat the same problem as above, except use the midpoints of rectangles in the Riemann sum as the sample points.
- (5) (Problem #24, Chapter 15.2) Sketch the solid whose volume is given by the following iterated integral, and compute the value of the integral:

$$\int_0^1 \int_0^1 (2 - x^2 - y^2) dy dx.$$

- (6) (Problem #38, Chapter 15.3) Sketch the solid whose volume is given by the following iterated integral, and compute the value of the integral:

$$\int_0^1 \int_0^{1-x^2} (1 - x) dy dx.$$