21C Homework 4

Due Friday April 29

Steinellos ≡ "Calculus and Analytic Geometry", 5th Edition,
S.K. Stein and A. Barcellos

Question 1 Sketch the surfaces $f(x,y) = 2xy$ and $g(u,v) = u^2 - v^2$. Can you find relations $x = x(u,v)$, $y = y(u,v)$ relating the two (*i.e.* such that $f(x(u,v), y(u,v)) = g(u,v)$)?. Explain your result in terms of the two sketches. Find all extrema and determine their types by computing the Hessian for both f and g.

Question 2 Consider the surface $f(x,y) = 2xy$. Find an equation for the tangent plane when $(x,y) = (1,1)$. Include it on your graph in question 1.

Question 3 Show that the maximal volume box that fits in a sphere is a cube.

Question 4 Steinellos, §14.9, pp 855-857, qq 4, 10, 12, 16, 24, 26, 30, 38, 42, 46, 50, 51

Question 5 Steinellos, §15.1, pp 887-888, qq 4, 6, 10, 12, 14, 18.

Question 6 Let $f(x,y) = x - y$. What is $\lim_{(x,y)\to(1,1)}$? Prove your answer.