University of Hawai'i at Mānoa | Department of Mathematics
W. Erb | Spring 2018

Math 253A - Accelerated Calculus III

Homework sheet 8 **Due 03/13/2018**

To read: Section 13.9, 14.1 and 14.2 in the book.

Problem 1
Consider the surface

$$z = x^3 + y^3 - 9xy + 1.$$

a) For which points (x, y) do you get maximal or minimal values z on the surface?

b) Show that one of the critical points for z is a saddle point and the other an extremum.

c) Determine whether the extremum in b) is a maximum or a minimum.

d) Determine the tangent plane of the surface at the point $(x_0, y_0, z_0) = (1, 0, 2)$.

Problem 2 (Velocity after a ricochet, hard)
A particle traveling in a straight line with constant velocity $\langle 1, 1, -5\rangle$ passes through the point $(0, 0, 30)$ and hits the surface $z = 2x^2 + 3y^3$. The particle ricochets off the surface, the angle of reflection being equal to the angle of incidence. Assuming no loss of speed, what is the velocity of the particle after the ricochet.

Problem 3 (§14.1 #2,10) Evaluate the iterated integrals

(a) $\displaystyle\int_0^2 \int_{-1}^1 (x - y)dydx,$

(b) $\displaystyle\int_0^1 \int_1^2 xye^x dydx.$

Problem 4 Compute the double integral

$$\iint_R \frac{xe^{x\tan y}}{\cos^2 y}\, dxdy,$$

where R is the rectangular region $0 \le x \le 1$, $0 \le y \le \pi/4$.