Homework 6, due **12:45 Friday 28 April 2017, to Dr. Pang's mailbox on 12F FSC**

You must justify your answers to receive full credit.

You may use any (correct) method on the extremisation problems, regardless of which section the questions come from.

- 13.2 Q1, 9
- 13.3 Q6 (You may assume that a shortest distance exists. Hint: minimising the distance function is the same as minimising the distance-squared function, and the algebra is easier if you let the objective function be the distance-squared.)
- 13.3 Q21 (You may assume that this minimum exists.)
- 12.8 Q5, 11 - in Q11, find also $\left(\frac{\partial^2 x}{\partial y^2}\right)_z$ when $(x, y, z, w) = \left(\frac{4}{5}, \frac{3}{5}, 0, 0\right)$.
- 12.8 Q12, 14
- 12.8 Q17, 24a - in Q17, for the computation of $\left(\frac{\partial y}{\partial u}\right)_v$ at $(u, v) = (1, 1)$, you may assume that $x = y = z = 1$ also.
- 14.4 Q32, 33 (Hints: in Q32, you may want to solve linear equations to solve for x and y in terms of u and v; in Q33, the first quadrant means the part with $x \geq 0$ and $y \geq 0$.)
- 14.6 Q9

1. Does the function $f(x, y) = x^2 - 2x + 1 + y^2$ have a maximum value or a minimum value on $\mathbb{R}^2$?

2. Find the maximum and minimum values of $f(x, y, z) = 2xy^2 + z$ over the closed region bounded by the paraboloid $z = 1 - x^2 - y^2$ and the plane $z = 0$. (Hint: the region has 3 boundary pieces, compare with the hall-ball in p7 of week 11 notes. The 1D boundary piece can be parametrised by $(x, y, z) = (\cos t, \sin t, 0)$. I think there are 10 candidate extrema in total.)

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