

## ASSIGNMENT 3 (4 QUESTIONS)

MA1104

To be handed in by **2pm Friday 18 March 2016 (Week 9)** to the **mailboxes outside LT34 on Level 3 of S17**. Please drop it into the right box according to your tutorial group.

Remember to write **your name** and **tutorial group number** on your solution. Late submission WILL NOT be accepted.

1.[10 marks] Find the point on the paraboloid  $z = \frac{x^2}{4} + \frac{y^2}{25}$  that is closest to the point  $(3, 0, 0)$ .

*Hint:* Let  $(x, y, z)$  be a point on the paraboloid. The distance  $D$  between  $(x, y, z)$  and the fixed point  $(3, 0, 0)$  is  $\sqrt{(x-3)^2 + y^2 + z^2}$ . Note that  $D$  is minimum if and only if  $D^2$  is minimum. Use Lagrange multiplier.

2.[10 marks] Suppose that the temperature of a metal plate is given by  $T(x, y) = x^2 + 2x + y^2$ , for points  $(x, y)$  on the elliptical plate defined by  $x^2 + 4y^2 \leq 24$ .

Find the maximum and minimum temperatures on the plate.

*Hint:* You need to consider the critical point(s). Use Lagrange multiplier on the boundary of the elliptical plate.

3.[10 marks] Evaluate the following double integral:

$$\int_0^4 \int_{\sqrt{y}}^2 \sqrt{x^2 + y} \, dx \, dy.$$

4.[10 marks] Rewrite the following iterated integral in the order  $dy \, dx \, dz$ :

$$\int_{-1}^1 \int_0^{\sqrt{1-x^2}} \int_0^{y/2} f(x, y, z) \, dz \, dy \, dx.$$