Optimization in Finance – Problem set 2

2.1 Find the maximum and minimum of $f(x, y) = 2x^2 + 4y^2 + 1$ subject to the constraint $g(x, y) = 2x^2 + y^2 = 6$.

2.2 Find the maximum of $f(x_1, x_2, x_3) = 5x_1x_2x_3$ subject to the constraint $x_1 + 2x_2 + 3x_3 = 24$.

2.3 Find the minimum of $x^2 - 2x + 2y^2 + z^2 + z$ subject to the constraints $x + y + z = 1$ and $2x - y - z = 5$.

2.4 Suppose

$$U(x, y, z) = xy^2z^3$$

is the utility function of a person consuming x, y and z units of three commodities X, Y and Z. Suppose that X, Y and Z each costs €3 per unit.

(a) If person has a budget of €90, how many of each units should he or she buy in order to maximise utility?

(b) What is maximum utility?