44. Exercises 5 & 11, Appendix B

45. Exercise 9, Section 17.4

46. Maximize \( f(x, y, z) = xy + yz \) subject to the constraints \( x^2 + y^2 = 2, \ yz = 2 \).

47. (Optional) Find the largest rectangular box with sides parallel to the co-ordinate axes that can be inscribed in the ellipsoid

\[
\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1.
\]

48. (a) Prove that the conclusion of the General Lagrange Multiplier Theorem can be written as follows: there exists a vector \( \lambda \in \mathbb{R}^k \) such that

\[
\nabla f(u) = (DG_u)^t \lambda
\]

(recall \( t \) means matrix transposition).

(b) Let \( A \) be a \( k \times n \) matrix of maximal rank, and \( b \in \mathbb{R}^k \). Prove that the point \( x \) closest to the origin satisfying \( Ax = b \) is \( x = A^t(AA^t)^{-1}b \) (Hint: minimize \( \|x\|^2 \) with the constraint \( Ax = b \)).