B09705009_OR_0516 吳驊祐

min $(x_1-2)^2+(x_2-4)^2$　　資管二 B09705009

s.t. $x_1+2x_2 \ge 12$　　吳驊祐

No.

Date: / /

(a) let $f(x) = (x_1-2)^2+(x_2-4)^2 = x_1^2+x_2^2-4x_1-8x_2+20$

$\nabla f(x) = \begin{bmatrix} 2x_1-4 \\ 2x_2-8 \end{bmatrix}$　$\nabla^2 f(x) = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$, which implies that $f(x)$ is positive semi-definite

is a convex function → proof

(b) $L(x|\lambda) = (x_1-2)^2+(x_2-4)^2+\lambda(12-x_1-2x_2)$, $\lambda \le 0$

(c) $z^L(\lambda) = \min\ (x_1-2)^2+(x_2-4)^2+\lambda(12-x_1-2x_2)$

(d) necessary condition :

(1) $x_1+2x_2 \ge 12$

(2) $\lambda \ge 0$

(3) $2x_1-4-\lambda=0$, $2x_2-8-2\lambda=0$

(4) $\lambda(12-x_1-2x_2)=0$

(e) if $(\lambda=0)$, $(x_1,x_2)=(2,4)$, but $2+8<12$

if $(\lambda>0)$, $x_1+2x_2=12$

$2x_1-4-\lambda=0 \to 4x_1-8-2\lambda=0$

$12-x_1-8-2\lambda=0$　$\Big] \to x_1=\frac{12}{5},\ x_2=\frac{24}{5},\ \lambda=\frac{4}{5}$

the optimal solution $(x_1,x_2)=(\frac{12}{5},\frac{24}{5})$