LAMPIRAN I

Eksplorasi Metode Derivatif Yang Dibatasi Dengan Program Maple-6 untuk kasus minimalisasi.

```
> restart;
> with(linalg):
Warning, the protected names norm and trace have been redefined
and unprotected
> fmin:=x->1/2*x1^2+1/2*x2^2+1/2*x3^2+1/2*x4^2;
```

$$fmin := x \to \frac{1}{2}x1^2 + \frac{1}{2}x2^2 + \frac{1}{2}x3^2 + \frac{1}{2}x4^2$$

```
> g1:=x->x1+2*x2+3*x3+5*x4-10;
```

$$g1 := x \to x1 + 2\,x2 + 3\,x3 + 5\,x4 - 10$$

```
> g2:=x->x1+2*x2+5*x3+6*x4-15;
```

$$g2 := x \to x1 + 2\,x2 + 5\,x3 + 6\,x4 - 15$$

```
f:=vector([1/2*x1^2+1/2*x2^2+1/2*x3^2+1/2*x4^2,x1+2*x2+
3*x3+5*x4-10,x1+2*x2+5*x3+6*x4-15]);
```

$$f := \left[\frac{1}{2}x1^2 + \frac{1}{2}x2^2 + \frac{1}{2}x3^2 + \frac{1}{2}x4^2, x1 + 2\,x2 + 3\,x3 + 5\,x4 - 10, x1 + 2\,x2 + 5\,x3 + 6\,x4 - 15\right]$$

```
> JAC:=jacobian(f,[x1,x2,x3,x4]);
```

$$JAC := \begin{bmatrix} x1 & x2 & x3 & x4 \\ 1 & 2 & 3 & 5 \\ 1 & 2 & 5 & 6 \end{bmatrix}$$

```
> J1:=matrix(2,2,[1,2, 1,2]);# andaikan x1 dan x2
sebagai variabel dependen
```

$$J1 := \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$$

```
> delta[J1]:=det(J1);# tidak memenuhi (tidak boleh sama
dengan nol)
```

$$\delta_{J1} := 0$$

```
> J2:=matrix(2,2,[1,3, 1,5]);# andaikan x1 dan x3
sebagai variabel dependen
```

$$J2 := \begin{bmatrix} 1 & 3 \\ 1 & 5 \end{bmatrix}$$

```
> delta[J2]:=det(J2);# memenuhi(berarti  boleh ambil
(x1,x3) sbg var. dependen),akibatnya x2 dan x4 sebagai
variabel independen
```

$$\delta_{J2} := 2$$

```
> B:=matrix(3,3,[x2,x1,x3, 2,1,3, 2,1,5]);# x2 berjalan
duluan kemudian x4
```

$$B := \begin{bmatrix} x2 & x1 & x3 \\ 2 & 1 & 3 \\ 2 & 1 & 5 \end{bmatrix}$$

```
> delta[B]:=det(B)=0 ;
```

$$\delta_B := 2\,x2 - 4\,x1 = 0$$

```
> C:=matrix(3,3,[x4,x1,x3, 5,1,3, 6,1,5]);
```

$$C := \begin{bmatrix} x4 & x1 & x3 \\ 5 & 1 & 3 \\ 6 & 1 & 5 \end{bmatrix}$$

```
> delta[C]:=det(C)=0  ;
```

$$\delta_C := 2\,x4 - 7\,x1 - x3 = 0$$

```
> g1(x)=0;
```

$$x1 + 2\,x2 + 3\,x3 + 5\,x4 - 10 = 0$$

```
> g2(x)=0;
```

$$x1 + 2\,x2 + 5\,x3 + 6\,x4 - 15 = 0$$

```
> delta[B];
```

$$2\,x2 - 4\,x1 = 0$$

```
> delta[C];
```

$$2\,x4 - 7\,x1 - x3 = 0$$

```
> A:=matrix(4,4,[1,2,3,5, 1,2,5,6, -4,2,0,0, -7,0,-
1,2]);
```

$$A := \begin{bmatrix} 1 & 2 & 3 & 5 \\ 1 & 2 & 5 & 6 \\ -4 & 2 & 0 & 0 \\ -7 & 0 & -1 & 2 \end{bmatrix}$$

```
> b:=vector([10,15,0,0]);
```

$$b := [10, 15, 0, 0]$$

```
> Ab:=augment(A,b);
```

$$Ab := \begin{bmatrix} 1 & 2 & 3 & 5 & 10 \\ 1 & 2 & 5 & 6 & 15 \\ -4 & 2 & 0 & 0 & 0 \\ -7 & 0 & -1 & 2 & 0 \end{bmatrix}$$

```
> spl:=geneqns(A,[x1,x2,x3,x4],b);
```

$$spl := \{2\,x2 - 4\,x1 = 0,\ 2\,x4 - 7\,x1 - x3 = 0,\ x1 + 2\,x2 + 3\,x3 + 5\,x4 = 10,\ x1 + 2\,x2 + 5\,x3 + 6\,x4 = 15\}$$

```
> rank(Ab);
```

$$4$$

```
> rank(A);# berarti solusi tunggal
```

$$4$$

```
> x:=linsolve(A,b);
```

$$x := \left[\frac{-5}{74}, \frac{-5}{37}, \frac{155}{74}, \frac{30}{37}\right]$$

```
> x1=-5/74;
```

$$x1 = \frac{-5}{74}$$

```
> x2=-5/37;
```

$$x2 = \frac{-5}{37}$$

```
> x3=155/74;
```

$$x3 = \frac{155}{74}$$

```
> x4=30/37;
```

$$x4 = \frac{30}{37}$$

```
> fmin(x);
```

$$\frac{1}{2}x1^2 + \frac{1}{2}x2^2 + \frac{1}{2}x3^2 + \frac{1}{2}x4^2$$

```
> fmin(x):=subs(x1=-5/74,
x2=-5/37,x3=155/74,x4=30/37,fmin(x));
```

$$\mathrm{fmin}(x) := \frac{375}{148}$$

LAMPIRAN II

Eksplorasi Metode Derivatif Yang Dibatasi dengan program Maple-6 untuk kasus maksimalisasi.

```
> restart;

> with(linalg):

Warning, the protected names norm and trace have been redefined and unprotected

> fmaks:=x->-7*x1^2-10*x2^2-7*x3^2+4*x1*x2-2*x1*x3+4*x2*x3;
```

$$fmaks := x \to -7\,x1^2 - 10\,x2^2 - 7\,x3^2 + 4\,x1\,x2 - 2\,x1\,x3 + 4\,x2\,x3$$

```
> g1:=x->x1+x2+3*x3-2;
```

$$g1 := x \to x1 + x2 + 3\,x3 - 2$$

```
> g2:=x->5*x1+2*x2+x3-5;
```

$$g2 := x \to 5\,x1 + 2\,x2 + x3 - 5$$

```
>f:=vector([-7*x1^2-10*x2^2-7*x3^2+4*x1*x2-2*x1*x3+4*x2*x3,x1+x2+3*x3-2,5*x1+2*x2+x3-5]);
```

$$f := [-7\,x1^2 - 10\,x2^2 - 7\,x3^2 + 4\,x1\,x2 - 2\,x1\,x3 + 4\,x2\,x3,\ x1 + x2 + 3\,x3 - 2,\ 5\,x1 + 2\,x2 + x3 - 5]$$

```
> JAC:=jacobian(f,[x1,x2,x3]);
```

$$JAC := \begin{bmatrix} -14\,x1 + 4\,x2 - 2\,x3 & -20\,x2 + 4\,x1 + 4\,x3 & -14\,x3 - 2\,x1 + 4\,x2 \\ 1 & 1 & 3 \\ 5 & 2 & 1 \end{bmatrix}$$

```
> J1:=matrix(2,2,[1,1, 5,2]);# andaikan x1 dan x2 sebagai
variabel dependen
```

$$J1 := \begin{bmatrix} 1 & 1 \\ 5 & 2 \end{bmatrix}$$

```
> delta[J1]:=det(J1);# tidak sama dengan nol berarti boleh
diambil sebagai variabel dependen),akibatnya x3 sebagai
variabel independen
```

$$\delta_{J1} := -3$$

```
> B:=matrix(3,3,[x3,x1,x2, 1,1,3, 5,2,1]);
```

$$B := \begin{bmatrix} x3 & x1 & x2 \\ 1 & 1 & 3 \\ 5 & 2 & 1 \end{bmatrix}$$

```
> delta[B]:=det(B)=0 ;
```

$$\delta_B := -5\,x3 + 14\,x1 - 3\,x2 = 0$$

```
> g1(x)=0;
```

$$x1 + x2 + 3\,x3 - 2 = 0$$

```
> g2(x)=0;
```

$$5\,x1 + 2\,x2 + x3 - 5 = 0$$

```
> delta[B];
```

$$-5\,x3 + 14\,x1 - 3\,x2 = 0$$

```
> A:=matrix(3,3,[1,1,3, 5,2,1, -5,14,-3]);
```

$$A := \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 1 \\ -5 & 14 & -3 \end{bmatrix}$$

```
> b:=vector([2,5,0]);
```

$$b := [2, 5, 0]$$

```
> Ab:=augment(A,b);
```

$$Ab := \begin{bmatrix} 1 & 1 & 3 & 2 \\ 5 & 2 & 1 & 5 \\ -5 & 14 & -3 & 0 \end{bmatrix}$$

```
> spl:=geneqns(A,[x1,x2,x3,x4],b);
```

$$spl := \{x1 + x2 + 3\,x3 = 2, 5\,x1 + 2\,x2 + x3 = 5, -5\,x1 + 14\,x2 - 3\,x3 = 0\}$$

```
> rank(Ab);
```

$$3$$

```
> rank(A);# berarti solusi tunggal
```

$$3$$

```
> x:=linsolve(A,b);
```

$$x := \left[\frac{37}{46}, \frac{8}{23}, \frac{13}{46}\right]$$

```
> x1=37/46;
```

$$x1 = \frac{37}{46}$$

```
> x2=8/23;
```

$$x2 = \frac{8}{23}$$

```
> x3=13/46;
```

$$x3 = \frac{13}{46}$$

```
> fmaks(x);
```

$$-7\,x1^2 - 10\,x2^2 - 7\,x3^2 + 4\,x1\,x2 - 2\,x1\,x3 + 4\,x2\,x3$$

```
> fmaks(x):=subs(x1=37/46,x2=8/23,x3=13/46,fmaks(x));
```

$$\mathrm{fmaks}(x) := \frac{-2772}{529}$$