Clr memory: $? \to X$: $? \to Y$: Lbl 0: $F(x,y) \to A$:

$M=0 \Rightarrow A \to B$ ▲ (Max X) $M=1 \Rightarrow A \to C$: (Max Y) $M=2 \Rightarrow A \to D$: (n)

$1M+ : Mod(\pi^r M) \div 128 + X \to X$: $M \neq 4 \Rightarrow Goto\ 0$:

$64\ (D-C)$ ▲ $4^{(7)}\ (D-2B+C$ ▲

Clr memory: $? \to X$: $? \to Y$: Lbl: 0:

$F(x,y) \to A$: $M=0 \Rightarrow A \to B$ ▲ $M=1 \Rightarrow A \to C$:

$M=2 \Rightarrow A \to D$: $1M+$: $Mod(\pi^r M) \div 128$:

If $\boxed{Var}$ $=0$: Then $Ans + X \to X$: Else

$Ans + Y \to Y$: $M \neq 4 \Rightarrow Goto\ 0$: $64(D-C)$ ▲

$4^{(7)}\ (D-2B+C$ ▲

程式 (153 bytes，不包括函數方程式)

Lbl 2: ?→D: ?→X: M$M-$: If D: *DFU* *IN*

Then 0→B: ?→Y: D^{-1}(Y−X→A: IfEnd: Goto 0: *D≠0*

Lbl 9: If D: Then B + Ans − . 5Ans(M^2=MD→B:

X+A→X: D>M$M+$ => Goto 0: AB: *D=0 f(x)*

Else Ans→C: Y→A: B→Y: C→B:

X + E − 4(1 − 3M→X: M≠2$M+$ => Goto 0:

A▲ 5 ᴇ 3(Y − C→B▲ ᴇ 8(Y + C − 2A→C: IfEnd▲ Goto 2:

Lbl 0: X^3 − 2X − 1: Goto 9

$0 \to D$, ✗

$1 \to Zn$; 区间).a.b

$\dfrac{(x^2+y^2)(2) - 2x(2x)}{(x^2+y^2)^2}$

0.4; $\dfrac{2y^2-2x^2}{(x^2+y^2)^2} = 0.24$

$? \to X$; $? \to Y$: $MM-$;   (M=0) $\dfrac{22}{3721}$ 0.0059103

Lbl 9:

$f(x+0.0001)$ $f(x-0.0001)$

$C \to B$: Ans → C $X + 0.0001 \to X$: $M \neq 1$ M+ => Goto 0;

              $X - 0.0002 \to X$: $M \neq 2$ M+ =>

Goto 0: $2\xi4(B-C)$▲

$f(x) \to C$ Lbl 0 : $F(x,y)$: Goto 9;

$\quad \to A$

$B \to Y$

$f(x) \to B$

$X + E - 4$

$$\frac{\partial}{\partial x} = \frac{f(x+h_1, y) - f(x, y)}{h_1}$$

$$\frac{\partial}{\partial y} = \frac{f(x, y+h_1) - f(x, y)}{h_1}$$

$$\frac{\partial}{\partial x^2} = \frac{-f(x-h_1, y) + 2f(x, y) - f(x+h_1, y)}{h_1^2}$$

$$\frac{d}{\partial y^2} = \frac{-f(x, y-h_1) + 2f(x, y) - f(x, y+h_1)}{h_1^2}$$

$$\frac{\partial}{\partial x} \frac{\partial f}{\partial y} = \frac{f(x+h_1, y+h_1) - f(x+h_1, y-h_1) - f(x-h_1, y+h_1) + f(x-h_1, y-h_1)}{4h_1^2}$$

① Input $f(x,y)$, 出 $\frac{\partial}{\partial x}$, $\frac{\partial}{\partial y}$, $\frac{\partial}{\partial x^2}$, $\frac{\partial}{\partial y^2}$, $\frac{\partial}{\partial x \partial y}$, D,

X, Y,

再問 u, 出 $|u|^2$, 和 $f \cdot \hat{u}$.

驗算 Lagrange, 出 $f(x,y)$

② Input $f(A,B,C,D)$ 出
$g(A,B,C,D)$

$\mathcal{L}$ :: A, B, C, D,

$\frac{d\mathcal{L}}{dA} =$ 出 : ① $\frac{\partial f}{\partial x} - \lambda \frac{\partial g}{\partial x}$

② $\frac{\partial f}{\partial y} - \lambda \frac{\partial g}{\partial y}$

③ $\frac{\partial f}{\partial z} - \lambda \frac{\partial g}{\partial z}$

④ $g(A,B,C,D)$

⑤ $f(A,B,C,D)$

③ Limit, Input $x,y, f(x,y) \rightarrow$ 出 Limit 和款.

(4) Input u, $\frac{u}{\|u\|}$, input v, $\frac{u}{v}$ dot, cross,

distance to plane.

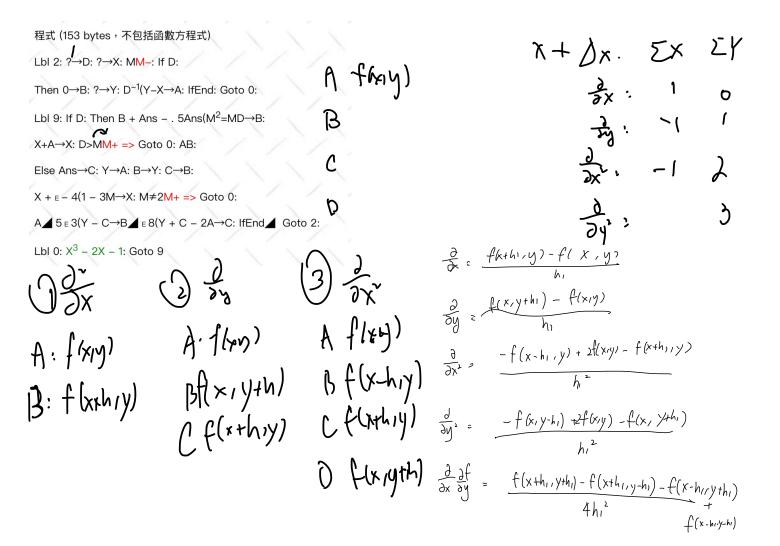ClrStat:FreqOn:?->X:?->Y:1DT:Goto 0:Lbl 2:If SUMY<=1:Then A=0=>Ans->A: X+SUMX(e-7->X:0,SUMY=1DT:SUMY<=1=>Goto 0:C->D:B->C:Ans->B:SUMY<=1=>e7(B-A▶SUMY>=2=>Goto 3:-2,1DT:Y+SUMY(e-7->Y:SUMY=1=>Goto 2:Lbl 3:SUMY>=2=>Goto 2:

程式 (153 bytes，不包括函數方程式)

Lbl 2: ?→D: ?→X: M M−: If D:

Then 0→B: ?→Y: D⁻¹(Y−X→A: IfEnd: Goto 0:

Lbl 9: If D: Then B + Ans − . 5Ans(M²=MD→B:

X+A→X: D>M M+ => Goto 0: AB:

Else Ans→C: Y→A: B→Y: C→B:

X + E − 4(1 − 3M→X: M≠2 M+ => Goto 0:

A◢ 5 ᴇ 3(Y − C→B◢ ᴇ 8(Y + C − 2A→C: IfEnd◢ Goto 2:

Lbl 0: X³ − 2X − 1: Goto 9

A $f(x,y)$

B

C

D

① $\frac{\partial}{\partial x}$

A: $f(x,y)$

B: $f(x+h,y)$

② $\frac{\partial}{\partial y}$

A: $f(x,y)$

B $f(x,y+h)$

C $f(x+h,y)$

③ $\frac{\partial}{\partial x^2}$

A $f(x,y)$

B $f(x-h,y)$

C $f(x+h,y)$

D $f(x,y+h)$

$$x + \Delta x. \quad \Sigma X \quad \Sigma Y$$

$\frac{\partial}{\partial x}:$ 1   0

$\frac{\partial}{\partial y}:$ -1   1

$\frac{\partial}{\partial x^2}:$ -1   2

$\frac{\partial}{\partial y^2}:$ 3

$$\frac{\partial}{\partial x} = \frac{f(x+h_1,y)-f(x,y)}{h_1}$$

$$\frac{\partial}{\partial y} = \frac{f(x,y+h_1)-f(x,y)}{h_1}$$

$$\frac{\partial}{\partial x^2} = \frac{-f(x-h_1,y)+2f(x,y)-f(x+h_1,y)}{h_1^2}$$

$$\frac{\partial}{\partial y^2} = \frac{-f(x,y-h_1)+2f(x,y)-f(x,y+h_1)}{h_1^2}$$

$$\frac{\partial}{\partial x}\frac{\partial f}{\partial y} = \frac{f(x+h_1,y+h_1)-f(x+h_1,y-h_1)-f(x-h_1,y+h_1)}{4h_1^2} + f(x-h_1,y-h_1)$$

$F(x,y) \to A:$ $D+1 \to D:$

Lbl 9 : if (D = 0) Then $(SUMX=1)-2,$

partialx(): $x + SUMX \, E^{-7} \to X:$ $y + SUMY E^{-7} \to Y:$ $D=0 \Rightarrow Goto \; 0;$ $SUMY = 0P7$

Ans→B : E7(B-

B→C

$\frac{\partial}{\partial}$ ClrStat:FreqOn:?->X:?->Y:1DT:Goto 0:Lbl 9:A=0=>Ans->A:If
D<=1:Then B->C:Ans->B:D+1-
>D:SUMX=1-2,SUMY=0DT:X+SUMXe-7->X:Y+SUMYe-7->Y:If
B=0AND C=0 Then Goto 0 :Else C=0: Goto 0:IfEnd:e7(B-
A▶Goto 9:
Lbl 0:2X/(X^2+Y^2:Goto 9:

Else (D = 4) Then

ifEnd.

Lbl 0 : $\bar{F}(x,y)$: Lbl 9:

		1	0
		-1	1
		0	1
		-2	0
		-2	1
$\frac{\partial}{\partial x}:$		$\sum^{X}_{0}$	$\sum^{Y}_{0}$
A $f(x,y)$	$\frac{\partial}{\partial x}$	1	0
B $f(x+h,y)$	$\frac{\partial}{\partial y}$	0	A
C $f(x,y+h)$.	$\frac{\partial}{\partial x^2}$	-1	0

$f(x,y)$ ✓

-4000

$\frac{\partial}{\partial x}$

ClrStat:FreqOn:?->X:?->Y:0->D:0->A:0->B:0->C:1,0DT:Goto 0:Lbl 9:
If A=0:Then Ans->A£ Ifend:

If D<=2:Then Ans->M:B->C:M->B:D+1->D: X+SumX(e-5->X:Y+SumY(e-5->Y:
Ifend:

If SumY+Sum X=0:Then 0,-2DT:Goto 0:Ifend:
If SumX+SumY=1:Then -2,1DT:Goto 0:Ifend:

ans->m:5(C-A£ e5(B-A£ $\frac{\partial}{\partial y}$.

If D=3:Then e14(2A-M-C->C£ D+1->D:2,2DT:
X+SumX(e-5->X:Y+SumY(e-5->Y:Goto 0:Ifend:

If D=4:Then e14(2A-Ans-B->B£ D+1->D:-2,-1DT: X+SumX(e-5->X:Y+SumY(e-5->Y:Goto 0:Ifend:

If D=5:Then Ans->M:D+1->D:3,0DT: X+SumX(e-5->X:Y+SumY(e-5->Y:Goto 0:Ifend:

If D=6:Then Ans,0DT:D+1->D:Y+2e-5->Y:Goto 0:Ifend:

If D=7:Then Ans->A:D+1->D:X-2e-7->X:Goto 0:Ifend:

If D=8:Then 4e14(M+A-SumX-Ans->M£:BC-M^2£

If D<0:Then Lbl 0:F(X,Y):Goto 9:Ifend:

$\frac{\partial}{\partial x}$
$\begin{Bmatrix} 1 & , & 0 \end{Bmatrix}$

DT²->2 $\begin{pmatrix} 1,1 & x+h, \; y+0h \\ & -h, \; +h \end{pmatrix}$

$\sum \begin{matrix} -1 & 1 \end{matrix}$

DT=0,-2 $\begin{pmatrix} x+0h, \; y+h \\ \end{pmatrix}$

$\sum \begin{matrix} -1 & -1 \\ -h & -h \end{matrix}$

$x-h, \; y$

DT=2,1 $\begin{pmatrix} +1 & +1 \\ x & y-h \end{pmatrix}$

DT=-2,1 $\begin{pmatrix} -1 & 0 \\ x-h & y-h \end{pmatrix}$

DT=3,0 $\begin{pmatrix} +2 & 0 \\ x+h & y-h \end{pmatrix}$

DT=-2,2 $\begin{pmatrix} 0 & +2 \\ x+h & y+h \end{pmatrix}$

DT=-2,-2 $\begin{pmatrix} -2 & 0 \\ x-h & y+h \end{pmatrix}$

$0.40000 \, 24$
$0.39999 \, 68$

$$f(x,y) = \frac{2x}{x^2+y^2} \qquad f(1,2) = \frac{2}{5}$$

$$\frac{\partial}{\partial x} = \frac{(x^2+y^2)(2) - 2x(2x)}{(x^2+y^2)^2} \qquad \frac{2y^2 \cdot 2x^2}{}$$

$$f(1,2) = \frac{10-4}{25} = \frac{6}{25}$$

$$\frac{\partial}{\partial y} = \frac{-2x(2y)}{(x^2+y^2)^2} \qquad f(1,2) = \frac{-8}{25} \qquad \overline{(x^2+y^2)^2}$$

$$\frac{\partial}{\partial x^2} = \frac{(x^2+y^2)^2(-4x) - (2y^2-2x^2)(2(x^2+y^2)(2x))}{(x^2+y^2)^4}$$

$$= \frac{-4x(x^2+y^2)^2 - 4x(2y^2-2x^2)(x^2+y^2)}{(x^2+y^2)^4}$$

$$= \frac{-4(25) - 4(6)(5)}{5^4} = \frac{400-120}{25 \cdot 25} = \frac{-220}{625}$$

$$\frac{\partial}{\partial x}\frac{\partial}{\partial y} = \frac{(x^2+y^2)^2(-4y) - (-4xy)(2(x^2+y^2)(2x))}{(x^2+y^2)^4}$$

$$= \frac{-4y(x^2+y^2)^2 + 16xy^2(x^2+y^2)}{(x^2+y^2)^4}$$

$$= \frac{-4(2)(5)^2 + 16(2)(5)}{5^4} = 0.064$$

ClrStat: FreqOn : ?→X: ?→Y: 0→A: 0→B: 0→ C: 0→D: Goto 0:

Lbl 9: If A=0: Then Ans→M: Else Ans→A ▲ Ifend:

If D=0: Then D+1→D=   X+E⁻5 → X: Goto 0: Ifend:

If D=1 : Then^{E√(M-A)▲} (f(x+h,y))_{D+1→D}
M→B: : X-E⁻5 → X : Y+E-5→Y :
Goto 0: Ifend:

                            f(x,y+h)
If D=2: Then E√(M-A) ▲ M→C : D+1→D: X-E-5→X:
Y-E-5→Y: Goto 0: Ifend:

If D=3: Then (2A-M-B)E 10 ▲ D+1→D: X+E-5→X:
Y-E-5 ≠Y: Goto 0: Ifend:

If D=4: Then (2A-M-C) E 10 ▲ D+1→D: X-E-5→X:
Goto 0: Ifend:

p:

0 original → A

$\frac{\partial}{\partial x}$:   x+h $\overset{\text{th}}{\underset{\downarrow}{}}$ y₀   → M→B, → E∫(B−A)

1   $\downarrow$ −h   y· $\downarrow$ +h

   $\frac{\partial}{\partial y}$:   x   y+h   → M→C   E∫(C−A)

2   $\downarrow$ −h $\downarrow$ −h

   $\frac{\partial}{\partial x^2}$:   x−h   y   → (2A−M−B)ε10 →B

3   $\downarrow$ +h $\downarrow$ −h

   $\frac{\partial}{\partial y^2}$:   x   y−h   → (2A−M−C)ε10 →C

4   $\downarrow$ −h $\downarrow$ 0

   $\frac{\partial}{\partial x}\frac{\partial}{\partial y}$:   x−h   y−h   → Σx ⊕

5   $\downarrow$ +2h $\downarrow$ 0

   x+h   y−h   → A ⊖

6   $\downarrow$ 0 $\downarrow$ +2h

   x+h   y+h   → Σy ⊕

7   $\downarrow$ −2h $\downarrow$ 0

   x−h   y+h   → M ⊖

∫→result 9D:

0.4