

>  
實習17.3

>  $f := (x, y) \rightarrow \exp(-x^2 - y^2) \cdot (2 \cdot x^2 + y^2)$   
 $f := (x, y) \mapsto e^{-x^2 - y^2} (2x^2 + y^2)$  (1)

(1)  
>  $\text{solve}(\{\text{diff}(f(x, y), x) = 0, \text{diff}(f(x, y), y) = 0\}, \{x, y\})$   
 $\{x=0, y=0\}, \{x=1, y=0\}, \{x=-1, y=0\}, \{x=0, y=1\}, \{x=0, y=-1\}$  (2)

(2)  
>  $\text{det}(H) := \text{diff}(f(x, y), x, x) \cdot \text{diff}(f(x, y), y, y) - \text{diff}(f(x, y), x, y)^2$   
 $\text{det} := H \mapsto \left( \frac{\partial^2}{\partial x^2} f(x, y) \right) \left( \frac{\partial^2}{\partial y^2} f(x, y) \right) - \left( \frac{\partial}{\partial y} (f(x, y), x) \right)^2$  (3)

>  $\text{subs}(x=0, y=0, \text{det}(H))$   
 $8 (e^0)^2$  (4)

>  $\text{subs}(x=0, y=0, \text{diff}(f(x, y), x, x))$   
 $4 e^0$  (5)

>  $\text{subs}(x=1, y=0, \text{det}(H))$   
 $16 (e^{-1})^2$  (6)

>  $\text{subs}(x=1, y=0, \text{diff}(f(x, y), x, x))$   
 $-8 e^{-1}$  (7)

>  $\text{subs}(x=-1, y=0, \text{det}(H))$   
 $16 (e^{-1})^2$  (8)

>  $\text{subs}(x=-1, y=0, \text{diff}(f(x, y), x, x))$   
 $-8 e^{-1}$  (9)

>  $\text{subs}(x=0, y=1, \text{det}(H))$   
 $-8 (e^{-1})^2$  (10)

>  $\text{subs}(x=0, y=-1, \text{det}(H))$   
 $-8 (e^{-1})^2$  (11)

>  $f(0, 0)$   
 $0$  (12)

>  $f(1, 0)$   
 $2 e^{-1}$  (13)

>  
>  $f(-1, 0)$   
 $2 e^{-1}$  (14)

極大值  $f(1,0)=f(-1,0)=2/e$   
極小值  $f(0,0)=0$

>  
(3)  
>  $\text{plot3d}(f(x, y), x=-1.5..1.5, y=-1.5..1.5, \text{style}=\text{patchcontour}, \text{contours}=50)$

