Ex Find critical points of $\exp(1+x^2-y^2)$ & use 2 der. test to classify them as local maxima or neither.

Soln $f_x = 2x\exp(1+x^2-y^2)$ $f_y = -2y\exp(1+x^2-y^2)$

$f_x \Rightarrow (0,0)$.

$f_{xx} = 2(1+2x^2)\exp(1+x^2-y^2)$

$f_{yy} = -2(1-2y^2)\exp(1+x^2-y^2)$

$f_{xy} = -4xy[\exp(1+x^2-y^2)]$

$f_{xx}f_{yy} - f_{xy}^2 = (2e)(-2e) - 0 = -4e^2 < 0$

Neither

Ex Find global extr. values of $f(x,y) = 5x^2 - 2y^2 + 10$ on the disk $x^2+y^2 \le 1$.

Proof Soln ~~$x =$~~ Boundary ~~$= 5x^2 - 2y^2 + 10$~~

$x = \cos t \quad y = \sin t$

$f(t) = 5\cos^2 t - 2\sin^2 t + 10$

$f'(t) = -14\cos t \sin t = 0 \Rightarrow t = 0, \frac{\pi}{2}, \pi, \#3, 2$

$(1,0)\ (0,1)\ (-1,0)\ (0,-1)$

$f(1,0) = 15 = f(-1,0) \quad f(0,1) = 8 = f(0,-1)$

Inside $f_x(x,y) = 10x \quad f_y(x,y) = -4y$ Need test?

$10. \Rightarrow$ max $= 15$.