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Maec330 Quiz # 1
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9/10

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Let $f(x,y,z) = \frac{1}{2}(x^2 + ay^2 + z^2) + axy + yz + x + y + z$. Find the critical point of f and determine the value(s) of a for which this critical point is a global ~~maximum~~ min.

$f_x = x + ay + 1 = 0$ ✓

$f_y = ay + ax + z + 1 = 0$

$f_z = z + y + 1 = 0$ ✓ 3

$D^2f = \begin{pmatrix} f_{xx} & f_{xy} & f_{xz} \\ f_{yx} & f_{yy} & f_{yz} \\ f_{zx} & f_{yz} & f_{zz} \end{pmatrix} \Rightarrow \begin{bmatrix} 1 & a & 0 \\ a & a & 1 \\ 0 & 1 & 1 \end{bmatrix}$ 3

$|D^2f_1| = 1$ ✓

$|D^2f_2| = \begin{vmatrix} 1 & a \\ a & a \end{vmatrix} = a - a^2$

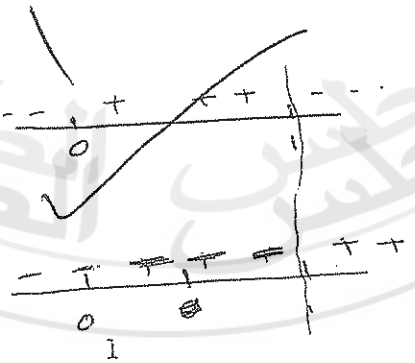
$|D^2f_3| = a - 1$??

has min at the critical => positive semi-def not.

$|D^2f_1| = 1 > 0$ ✓

$|D^2f_2| = a - a^2 > 0$

$a(1-a) > 0$



$|D^2f_3| = a - 1 > 0$

$a > 1$

1

There is no (a) make the critical min ✓