Selected Solutions to X4

1) Note that \( f_x(a,b) \), etc. are constant. Then compute:
\[
Q_x(x,y) = f_x(a,b) + f_{xx}(a,b)(x-a) + f_{xy}(a,b)(y-b)
\]
Setting \( x = a \), \( y = b \) yields \( Q_x(a,b) = f_x(a,b) \).
Similarly for \( Q_y(a,b), Q_{xx}(a,b) \), etc.

4) b) apply change of coordinates
\[
x' = \frac{a}{b^2} x + \frac{1}{2} b \frac{a}{b} y, \quad y' = \frac{b}{2a} y
\]
Then \( f(x,y) = f(x',y') = (x')^2 + (y')^2 \)
has a local minimum at \((0,0)\)
because \( f(0,0) = 0 \) and \( f(x,y) \geq 0 \)
for all \((x,y)\).

Similar arguments solve c) & d) like in the lecture.