- $z = f(x, y)$
- $f \in C^2$
- $x = r^2 + s^2$
- $y = 2rs$

$\frac{\partial^2 z}{\partial r \partial s} = \frac{\partial}{\partial r}(\frac{\partial z}{\partial s})$
$\frac{\partial z}{\partial s} = f_x \cdot 2s + f_y \cdot 2r$
$\frac{\partial (f_x \cdot 2s)}{\partial r} = f_{xx} \cdot 2r + f_{xy} \cdot 2s$
$\frac{\partial (f_y \cdot 2r)}{\partial r} = (f_{yx} \cdot 2r + f_{yy} \cdot 2s)2r + 2f_y$
$\frac{\partial^2 z}{\partial r \partial s} = f_{xx} \cdot 2r + f_{xy} \cdot 2s + (f_{yx} \cdot 2r + f_{yy} \cdot 2s)2r + 2f_y$