

ALA BLATTNR. 09 26.06.2014

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1. (i)

$$f(x, y) = 2x^2y^2 - 3xy + 4x + 2$$

$$f_x = 4xy^2 - 3y + 4 \quad f_y = 4x^2y - 3x$$

git

(ii)

$$f(x, y) = \cos(x^2y) \cdot e^{xy}$$

$$f_x = -\sin(x^2y) \cdot 2xy \cdot e^{xy} + \cos(x^2y) \cdot y \cdot e^{xy}$$

$$f_y = -\sin(x^2y) \cdot x^2 \cdot e^{xy} + \cos(x^2y) \cdot x \cdot e^{xy}$$

(iii)

$$f(x, y) = \frac{\sin x + \cos y}{x^2 + y^2}$$

$$f_x = \frac{\cos x \cdot x^2y^2 - (\sin x + \cos y) \cdot 2x}{(x^2 + y^2)^2}$$

$$f_y = \frac{-\sin \cdot x^2y^2 - (\sin x + \cos y) \cdot 2y}{(x^2 + y^2)^2}$$

(iv)

$$f(x, y) = \sqrt{1 - x^2 - y^2}$$

$$f_x = \frac{1}{2}(1 - 2x)^{-\frac{1}{2}} \quad f_y = \frac{1}{2}(1 - 2y)^{-\frac{1}{2}}$$

2. TODO**3.** (i)

$$f(x, y) = -x^2 - y^2 + xy + x + 6$$

$$f_x = -2x + y + 1$$

$$f_y = -2y + x$$

$$f_{xx} = -2$$

$$f_{yy} = -2$$

$$f_{xy} = 1$$

$$f_{yx} = -2$$

$$A = \begin{pmatrix} -2 & 1 \\ -2 & -2 \end{pmatrix}$$

A ist negativ definit, da $f_{xx} = -2$ und $\Delta = 2$.

(ii)

$$f(x, y) = 3x^2 + 2y^2 - xy - 4x + y + 1$$

$$f_x = 6x - y - 4$$

$$f_y = 4y - x + 1$$

$$f_{xx} = 6$$

$$f_{yy} = 4$$

$$f_{xy} = -1$$

$$f_{yx} = -1$$

$$B = \begin{pmatrix} 6 & -1 \\ -1 & 4 \end{pmatrix}$$

B ist positiv definit, da $f_{xx} = 6$ und $\Delta = 23 (> 0)$.

(iii)

$$f(x, y) = 3x^2 + y^2 + 4xy - x + y + 2 \qquad f_x = 6x + 4y - 1$$

$$f_y = 2y + 4x + 1$$

$$f_{xx} = 6$$

$$f_{yy} = 2$$

$$f_{xy} = 4$$

$$f_{yx} = 4$$

$$C = \begin{pmatrix} 6 & 4 \\ 4 & 2 \end{pmatrix}$$

C ist indefinit, da $f_{xx} = 12$ also positiv ist, aber $\Delta = -4 (< 0)$

(iv)

$$f(x, y) = x^3 + 4y^3 - 9x - 48y + 7$$

$$f_x = 3x^2 - 9$$

$$f_y = 12y^2 - 48$$

$$f_{xx} = 6x$$

$$f_{yy} = 12y$$

$$f_{xy} = 0$$

$$f_{yx} = 0$$

4.