ALA BLATTNR. 10 03.07.2014

Jonathan Siems, 6533519, Gruppe 12
Jan-Thomas Riemenschneider, 6524390, Gruppe 12
Tronje Krabbe, 6435002, Gruppe 9

3. Juli 2014

1. a)

$$f(x,y,z) = 2x^2 + y^2 + 4z^2 - 2yx - 2x - 6y + 8$$

$$f_x = 4x - 2 \qquad f_{xx} = 4$$
$$f_y = 2y - 2z - 6 \qquad f_{yy} = 2$$
$$f_z = 8z - 2y \qquad f_{zz} = 8$$

$$f_{xy} = 0 \qquad f_{yx} = 0$$
$$f_{xz} = 0 \qquad f_{zx} = 0$$
$$f_{yz} = -2 \qquad f_{zy} = -2$$

$$\begin{array}{l} I \\ II \\ III \end{array} \begin{pmatrix} 4x - 2 \\ 2y - 2z \\ 88z - 2y \end{pmatrix}$$

$$x = \frac{1}{2}, \quad y = 0, \quad z = 0$$

Für $f(x,y,z)$ ergibt sich somit $f\left(\frac{1}{2}, 0, 0\right) = \frac{15}{2}$
Damit ist der kritische Punkt bei $\left(\frac{1}{2}, 0, 0, \frac{15}{2}\right)$

Hesse Matrix:

$$A = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 2 & -2 \\ 0 & 0 & 8 \end{pmatrix}$$

$4 > 0, \Delta = 64$ A ist somit positiv definit.

2. a) (i) $\mathbf{x^2 + 2x - 35 = 0}$

$$\begin{aligned} x_{1|2} &= -\frac{2}{2} \pm \sqrt{\left(\frac{2}{2}\right)^2 + 35} \\ &= -1 \pm \sqrt{1 + 35} \end{aligned}$$

$$\mathbf{x_1 = 5} \qquad \mathbf{x_2 = -7}$$

(ii) $\mathbf{x^2 + 2x + 10 = 10}$

$$\begin{aligned} x_{1|2} &= -\frac{2}{2} \pm \sqrt{\left(\frac{2}{2}\right)^2 - 10} \\ &= -1 \pm \sqrt{1 - 10} \\ \mathbf{x_1} &= \mathbf{-1 + 3i} \qquad \mathbf{x_2 = -1 - 3i} \end{aligned}$$

(iii) $\mathbf{x^2 - 18x + 81 = 0}$

$$\begin{aligned} x_{1|2} &= -\frac{18}{2} \pm \sqrt{\left(-\frac{18}{2}\right)^2 - 81} \\ &= -9 \pm \sqrt{(-9)^2 - 81} \\ \mathbf{x_1} &= \mathbf{9} \end{aligned}$$

3.

4.