

Werkcollege 6

1. Find the stationary points of the following functions and for each of those stationary points, specify whether it is a local minimum, local maximum or a saddle point.

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

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

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

(d) $f(x, y) = (x^2 + y^2)e^{-y}$

2. Find the stationary points of the following functions.

(a) $f(x_1, \dots, x_n) = \sum_{i=1}^n e^{x_i^2}$

(b) $f(x_1, \dots, x_n) = \ln(\prod_{i=1}^n x_i)$, where $x_1 > 0, \dots, x_n > 0$

(c) $f(x_1, \dots, x_n) = \sum_{i=2}^n x_1(x_i - 2)^2$

3. Find the Cartesian coordinates corresponding to the following polar coordinates:

- $(r, \theta) = (2, \pi)$
- $(r, \theta) = (1, \frac{\pi}{2})$

4. Find the polar coordinates corresponding to the following cartesian coordinates:

- $(x, y) = (0, 2)$
- $(x, y) = (1, 1)$

5. Describe the following areas using polar coordinates:

- $\{(x, y) \mid x^2 + y^2 \leq 16\}$
- $\{(x, y) \mid x < 0, y > 0\}$
- $\{(x, y) \mid 1 \leq x^2 + y^2 \leq 16, x > 0\}$

6. Describe the following areas using cartesian coordinates:

- $\{(r, \theta) \mid 0 \leq r \leq 3\}$
- $\{(r, \theta) \mid 0 \leq \theta \leq \frac{\pi}{4}\}$