

Exercise Sheet 6

Applications of derivative and linearization, Storrer 6 + 7

Hand in: Wednesday, **01.11.2017**, ahead of the lecture.

MUST

Exercise 1

- What are the conditions for a function to be increasing or, respectively, decreasing on an interval I ?
- Explain the terms absolute maximum / minimum and relative maximum / minimum.
- How do you determine an inflection point? List all criteria!
- What is a saddle point?

STANDARD

Exercise 2 (9 points)

Consider the function $y = f(x) = (x + 1) \cdot e^{-x}$ with $x \in \mathbb{R}$.

- (1 point) Where is f positive, where is it negative?
- (1 point) Determine potential roots.
- (2 points) Where is f increasing, where decreasing?
- (1 point) Determine potential extrema.
- (2 points) Where does f turn to the left, where to the right?
- (1 point) Determine potential saddle points.
- (1 point) Draw a graph of the function.

Exercise 3 (5 points)

Consider the function $y = f(x) = |x^2 - 3x + 2|$ with $x \in \mathbb{R}$.

- (4 points) Draw the graph of the function $f(x)$. In particular determine the roots and extrema exactly.

- b) (1 point) Let the function be defined on the interval $[0, 2]$. Determine all extrema and indicate if it a extrema is local or global!

If you had trouble solving the last two exercises you should definitely solve more exercises on this topic! See Storrer.

Exercise 4 (4 points)

A polynomial of degree two which goes through the point $P(1/3)$. In this point the function has a slope of 1 and the slope in the point $Q(2/y)$ is 5. Determine the function.

Note on rating: 1 point for correct approach, 1 point for derivative, 1 point for equations, 1 point for correct solutions of the equations

Exercise 5 (2 points)

Consider the function $y = f(x) = \frac{1}{x^2}$ mit $x_0 = 0,01$ and linearize $f(x)$ at x_0 .

With the linear function $g(x)$ determine the value $g(0,0001)$ and compare this with the value $f(0,0001)$. What do you observe?

HONOURS

Exercise 6 (3 points)

Is there a point x_0 in \mathbb{R} where the tangent line to the graph of

$f : x \mapsto \sinh(x)$ is parallel to the line $y = 2x - 2$? How about the line $y = \frac{1}{2}x + 3$?

Draw a qualitative graph!

Hint: $\sinh(x) = \frac{1}{2}(e^x - e^{-x})$.