

Check list

The exam is based on the curriculum, which is stated on the web page of the course, and all exercises. Below you can find a *check list*, which summarizes the curriculum to some extent. You can use it to make sure you understand the concepts and didn't forget about anything.

- Norm (length) of a vector, unit vector
- Dot-product, cross-product
- Determinants

- Definition of limits, continuity, differentiability
- How to show that a function is continuous/not continuous?
- How to show that a function is differentiable/not differentiable?
- Partial derivatives (also of higher orders), directional derivatives
- When does the following hold true: $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$?
- Chain rule

- Implicit function theorem
- What are extreme points and how to find them?
- Classification of critical points (maximum, minimum, saddle point)
- What are bounded functions?
- Extreme value theorem
- First and second Taylor formula
- Lagrange multiplier method

- Definition of integrability and properties
- Double and triple integrals
- Integration over general domains (type I and type II domains)
- Area and volume of domains
- Changing the order of integration
- Change of variables theorem
- Change of variables for polar, spherical, and cylindrical coordinates.
- Mean value theorem
- Center of mass
- Parameterization of curves/surfaces
- Parameterization of curves/surfaces, if they are given by the graph of a function
- Speed and acceleration of a curve
- Tangent lines and tangent planes
- Orientation of curves/surfaces
- Length of curves/area of surfaces
- Integration of scalar fields and vector fields over curves and surfaces
- Does the integral of scalar fields/vector fields depend on the orientation of the curve/surface?
- Conservative fields (conditions and consequences)
- Greens theorem
- Divergence and curl
- Divergence theorem
- Stokes theorem