Tools for FEM Guideline

# Green’s 1st identity

# Basis functions

## Linear basis functions

|  |  |
| --- | --- |
| Shape function |  |
| Gradient of shape function |  |

### Alternative tool: Barycentric coordinates

Barycentric coordinates are an alternative expression.

|  |  |
| --- | --- |
|  |  |

Hint 1: is the edge opposite vertex

Hint 2: Compute the height of a triangle using the Hesse normal form, i.e. , where

## Polynomial basis functions

### On triangles

|  |  |
| --- | --- |
| Shape function |  |
| Gradient of shape function |  |

Using 2nd-order polynomials on triangles, there are three points on the vertices and three points on the midpoints of the edges. 🡺 Additional gridpoints needed!

### Construction with barycentric coordinates

ToDo: Concrete Gradients

### On quadrilaterals

|  |  |
| --- | --- |
| Shape function |  |
| Gradient of shape function |  |