



Learning objectives: Functions and polynomials

Obviously, the exam will be in English.

Summary:

- Polynomials in one variable, polynomial long division
- Functions (general theory), lines and linear functions

During the exam, no aids other than the usual supplies (pens, colored pencils, ruler (= Lineal), set square (= Geodreieck), compass (= Zirkel)) are permitted. (Calculators are not allowed.)

Paper, including scratch paper, will be provided.

Theory (knowledge): What one should know

- Definitions and terminology:
 - polynomial (in one variable), monomial
 - standard form of a polynomial
 - degree of a polynomial
 - coefficient at x^n
 - * leading coefficient
 - * constant coefficient
 - monic polynomial
 - zero polynomial
- Addition/subtraction and multiplication of polynomials
- Polynomial long division (algorithm)
- Definitions and terminology:
 - Function (= map, mapping)
 - domain = starting set = set of definition
 - codomain = target set
 - argument of a function (= what you plug in)
 - value of a function (at an argument)
- Notations:
 - old: intervals on real line
 - \mathbb{R}^* , \mathbb{R}^+ , \mathbb{R}^- , \mathbb{R}_0^+ , \mathbb{R}_0^-
 - Detailed notation of functions (and knowledge how to read this)
- Graph of a function
- Graphs of basic function (E7)
- Zero of a function
- maximal domain = maximal set of definition
- range of a function
- line: slope, y -intercept, slope angle=angle of inclination, slope triangle
- linear function
- “lines are (graphs of) linear functions”
- linear relationship, proportionality (proportional, factor of proportionality)
- how to find intersections of graphs of two functions (Memo 6.5.18)
- slopes and perpendicularity of lines (if and only if product of slopes is -1) (Memo 6.5.19)

Practical skills: What one should be able to do

- Calculating with polynomials (addition, subtraction, multiplication)
- For a given polynomial: Finding standard form, degree, coefficients, leading coefficient (is the polynomial monic?), constant coefficient.
- Performing polynomial long divisions.

We agreed on the following:

- If the result of a polynomial long division $\frac{p(x)}{q(x)} = p(x) : q(x)$ is to be written as an equality of

polynomials, the following is meant:

$$p(x) = s(x)q(x) + r(x)$$

$$\text{mit } \deg(r) < \deg(q)$$

- Understanding given definitions of functions
- Writing functions in detailed notation, writing down how to read this.
- Finding out whether detailed definitions of functions are correct or not; in the latter case: correcting the definition. (E5)
- Plotting (= drawing) graphs of functions. (Be careful when “guessing connecting curves between points”, cf. E7, e. g. x^2 near $x = 0$).
- Deciding whether a point lies on a graph
- Finding intersections between a graph and the coordinate axes
- Finding the maximal domain of a function (E11).
- Finding the range of a function.
- Finding slope, y -intercept, slope angle of a line
- For “special” angles: Find slope from slope angle.
- Plotting graphs of linear functions
- Being able to solve standard problems for lines (finding linear function of line given by point and slope (E17), of line given by two points (E18); intersection of two lines given by linear functions (E19), perpendicularity of lines (E20)).
- Being able to solve (real world) problems using linear functions (E21, E22, ...)
- Being able to solve geometric problems that can be solved using lines and linear functions (let’s see what we do on Thursday and Friday).