



MA055G & MA056G

Introduktionskurs i matematik

Block 5

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More about functions

References

[RS] section 7.1

[SL1] i kompendiet p. 12-17

[RS] sections 7.3-7.7

Lecture notes part 10 (available from course webpage).

Keywords

Domain, range, composition of functions, increasing and decreasing functions. Injective and surjective functions, invertible functions.

Introduction

In this block we shall look in more detail on properties that some functions have. We start by revising the definition of a function and the concepts of domain and range, and we revise how to compute the composition of two functions.

Some real-valued functions in one variable x get bigger and bigger as x gets bigger and bigger, these are called strictly increasing; some get smaller and smaller, these are called strictly decreasing. Most functions are not of this type, they have parts of their domain on which they are increasing and other parts of the domain on which they are decreasing.

We next study the properties of functions which are injective (one-to-one) and functions which are surjective (onto). Functions which are both one-to-one and onto are invertible (sv: inverterbar), and we look at the inverse function of some of the elementary functions we have studied earlier in the course.

Reading

Functions - domain and range

Start by reading [RS] section 7.1, 7.2 and 7.4 and [SL1] i kompendiet p. 11-15. You may also want to re-read lecture notes part 3. These can be found in pdf-format on the course web page. Here functions are introduced and the important concepts of domain (sv: definitionsmängd) and range (sv: värdemängd) are discussed. Read also page 168-171 in lecture notes 10.

Increasing and decreasing functions

Now read p. 172-174 in part 10 of the lecture notes. These give a short introduction to increasing and decreasing

functions. Read also [RS] section 7.5. It turns out that functions which are strictly increasing or strictly decreasing are invertible.

Inverse functions

Now read the remainder of part 10 in the lecture notes, these introduce the two properties of injectivity and surjectivity for functions and goes on to study functions which are invertible. Read also [SL1] i kompendiet p. 15-17 and [RS] sections 7.6-7.7. After introducing the concepts in general, we find the inverse functions of some of the elementary functions we have already studied in a previous block. In particular we restrict the domains of the sine and the cosine functions to intervals on which they are both one-to-one and onto, and thus it is possible to define inverse functions to both, the *arcsin* and *arccos* functions.

Exercises

Functions

- [RS] Testproblem 1 (on p. 205), 4 (on p. 213), 6 (on p. 214), 7 (on p. 216), 8 (on p. 220), 9-10 (on p. 223)
- [RS] Övningar till kapitel 7 p. 224-227: 7.1-7.2, 7.12-7.15, 7.16-7.22, 7.23(a)-(d), 7.24, 7.26-7.27.

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The author welcomes comments and corrections via [email](#). All contributions incorporated in updates of the manuscript will be acknowledged.

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