Midterm 1 - Topics

• You are required to prepare the following material (see topics on the next page), and only the following material, for Midterm 1. The list refers to the online posted lecture notes.

• No "cheat sheets" will be allowed, and calculators will be allowed but **not necessary**.

• The midterm will consist of four questions and you will have ten minutes per question.

• The best preparation is to do all the additional assignment problems as well as study the lecture notes closely.

• You should attend office hours if you have any questions before the midterm.

• You can also use sections 2.2, 2.3, 2.5, 2.6, 3.1. in the book for more examples, but remember the book is a guide and not quite the same as the lecture notes. For example we write ∇f for the gradient matrix of a vector valued function f whereas the book uses $\mathbf{D}(f)$. The book also finds limits with ϵ-δ and proves sets are open slightly differently to the way we do it.

Topics for midterm preparation

• Lecture 1 : Know the definition of distance, how to show that a given set is an open set.

• Lecture 2 : Know the definition of limits, how to use the properties of limits and substitution rule to work out limits, show the value of a limit using the ϵ-δ definition, how to prove that a limit does not exist.

• Lecture 3 : Know the definition of partial derivatives, how to find partial derivatives, and the definition of differentiability.

• Lecture 4 : Know how to prove a function is differentiable or not from the definition, how to find the tangent hyperplane to a surface, definition of gradient, definition of directional derivative, know that $\nabla f(a)$ is the direction in which f increases the fastest from a. **Omit level curves – Section 4.3**

• Lecture 5 : Know how to find the gradient matrix ∇f for a vector valued function $f : \mathbb{R}^n \to \mathbb{R}^m$, definition of differentiability for vector valued functions, how to use basic properties of derivatives, statement of the chain rule. **Omit how to prove whether a vector valued function is differentiable – Examples on page 2.**

• Lecture 6 : Know how to use the chain rule to find $\nabla(f \circ g)$ for various functions f and g.

• Lecture 7 : Know the definition of k times continuously differentiable functions and theorem of equality of mixed partial derivatives.

Omit: all proofs in the book, and section 2.4 in the book. You are not required to know anything about Taylor's Theorem.