MA2321, Annual Examination 2018
Syllabus of Examinable Material

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General Remarks

The lists below specify particular results (lemmas, propositions, theorems, corollaries) that candidates are expected to know and produce at the examination. In some cases the result is specified as “statement only”: in such cases candidates will not be asked to give proofs on the examination paper. Where proofs are examined, it is not expected that candidates reproduce a verbatim reproduction of a proof in the printed notes. If asked to prove a result, any valid proof (within the framework of the module) is acceptable. Indeed candidates, in preparing for the examination, may decide to focus on the key steps within a particular proof, with confidence that they can complete the proof on the basis of their general competence, combined with an overview of the basic strategy and significant steps of the proof. If another numbered result is needed as a prerequisite for a given proof, it can normally be presumed that the prerequisite result can be stated without proof. If a proof were expected of a prerequisite result, then the examination paper would have been drafted to explicitly require that proof in a previous part of the question. (Were there an exception to such a general principle, it would be in situations where one would not gain a significant number of marks by simply stating, for example, “This result follows directly from Theorem Goodnessonlyknows on setting $p = q$.”.)

Section 1

The results of this section are *non-examinable*. Candidates should however be familiar with results from this section to the extent that they are referenced and applied in subsequent sections.

Section 2

Candidates should be familiar with the definition of *limit points* and of *convergence* and *limits* of infinite sequences of points in Eucldidean spaces.

The following results and proofs are examinable:—

Proposition 2.1	(statement only)
Proposition 2.2	(statement only)
Lemma 2.3	
Theorem 2.6	(statement only)

Section 3

Candidates should be familiar with the definition of open and closed sets in subsets of Euclidean spaces. (In other words, given a subset X of a Euclidean space, candidates should be able to define what is meant to say that subset of X is *open* in X, or *closed* in X. Note that X may in some cases be the whole Euclidean space.)

Candidates should in particular be prepared to investigate specified subsets of Euclidean spaces in order to determine whether or not they are open in that space, and whether or not they are closed in that space.

The following results and proofs are examinable:—

Lemma 3.1	
Lemma 3.2	
Proposition 3.3	
Lemma 3.5	
Proposition 3.6	(statement only)
Lemma 3.7	

Section 4

Candidates should be familiar with, and be able to formally state, the principal definitions in this section, including the definition of a *limit* of function of several real variables, and the definition of *continuity* for such a function.

The following results and proofs are examinable:—

Lemma 4.1
Lemma 4.2
Proposition 4.7
Proposition 4.8
Proposition 4.9
Proposition 4.10
Proposition 4.11
Proposition 4.12
Lemma 4.13
Proposition 4.14
Proposition 4.18
Proposition 4.20
Theorem 4.21

Section 5

Candidates should be familiar with the principal definitions in this section, including the definitions of *partition*, *upper* and *lower sums*, *upper* and *lower Riemann integrals*, *Riemann-integrability* and the *Riemann integral*.

The following results and proofs are examinable:—

Lemma 5.1	(statement only)
Lemma 5.2	
Lemma 5.3	
Proposition 5.5	(statement only)
Proposition 5.6	
Proposition 5.7	(statement only)
Proposition 5.8	
Theorem 5.10	
Theorem 5.11	

Section 6

This section is *non-examinable* in its entirety.

Section 7

The following results and proofs are examinable:—

Theorem 7.1	(statement only)
Theorem 7.2	(statement only)
Lemma 7.6	
Theorem 7.7	
Proposition 7.12	

Section 8

Candidates should be familiar with the definition of the *operator norm* $\|.\|_{\mathrm{op}}$. Otherwise the results and proofs in Section 8 are *non-examinable.*

Section 9

Candidates should be familiar with the definition of differentiability stated in subsection 9.2, and with the definition of the derivative of a differentiable function of several variables at a point of its domain. (Note that the derivative of such a function at a given point is a linear transformation.)

Candidates should be competent to carry through exercises corresponding to the examples in this section (and in some of the examination questions and assignment questions from previous years, where related to the material of this section.)

The following results and proofs are examinable:—

Lemma 9.2	
Lemma 9.3	
Lemma 9.4	
Lemma 9.5	
Proposition 9.6	
Proposition 9.7	
Proposition 9.8	(statement only)
Lemma 9.9 Proposition 9.10	
Corollary 9.11	
Theorem 9.12	(statement only)
Corollary 9.13	(statement only)

Candidates should in addition be familiar with the statements in subsection 9.8 "Summary of Differentiability Results".

Section 10

The following results and proofs are examinable:—

Theorem 10.1
Lemma 10.3
Lemma 10.4 (statement only)
Lemma 10.5
Theorem 10.6

Section 11

There is no examinable material in this section.