

## EXAM QUESTIONS: MEASURE AND INTEGRATION

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Every oral exam consists of answering as good as possible *one* out of two randomly chosen questions from the following list of questions within 15 minutes. After posing the two questions three minutes of preparation time are granted. A Definition/Theorem/Remark/Example being stated means that the question is on (some of) the assertions (including some of the proofs). Of course one may use results from the lecture notes properly quoted, also the stand-alone meaning of the results in question should be clear. Please try to work out answers in groups or alone as preparation of the exam.

Lecture notes shall be on the table and can be used during preparation time but not during answering the question.

- (1) Subsection I.1 and Theorem I.1.8
- (2) Set functions, measures up to Proposition I.2.4
- (3) Theorem I.2.6
- (4) Theorem I.2.9 and Proposition I.2.12
- (5) Theorem I.2.13
- (6) Proposition I.2.17
- (7) Definition I.3.1 and the fact that with a measure one can define an outer measure.
- (8) Theorem I.3.3. and first part of the proof
- (9) Theorem I.3.3. and second part of the proof
- (10) Theorem I.3.3. and third, fourth part of the proof
- (11) Definition I.3.5. and Lemma I.3.6
- (12) Theorem I.3.7
- (13) Theorem I.3.8
- (14) Example I.3.9
- (15) Lebesgue measure and Lemma I.4.4
- (16) Theorem I.4.7 on non-Lebesgue measurable sets
- (17) Theorem II.1.14
- (18) Theorem II.1.18
- (19) Lemma II.2.2, Definition II.2.3 and Corollary II.2.4
- (20) Lemma II.2.6
- (21) Proposition II.2.7 and Definition II.2.8
- (22) Theorem II.2.9 and Corollary II.2.10
- (23) Proposition II.2.14
- (24) Lemma II.2.17 and Lemma II.2.21
- (25) Theorem II.3.1
- (26) Theorem II.3.2
- (27) Theorem II.3.4
- (28) Definition II.3.5 and Lemma II.3.7
- (29) Theorem II.3.8

- (30) Theorem II.3.10
- (31) Remark II.3.11
- (32) Example II.3.12, Definition II.3.13 and Remark II.3.14
- (33) Remark II.3.16 and Lemma II.3.17
- (34) Theorem II.3.18
- (35) Proposition II.3.21
- (36) Theorem II.3.22
- (37) Theorem II.4.2
- (38) Proposition II.4.4
- (39) Theorem II.4.11
- (40) Theorem II.4.14
- (41) Theorem II.5.3
- (42) Lemma II.6.1 and Lemma II.6.2
- (43) Definition II.6.4 and Proposition II.6.5
- (44) Theorem II.6.6: first part up to existence of  $g_1$
- (45) Theorem II.6.6: second part of the proof starting at the definition of the set  $\mathcal{G}$ .
- (46) Proposition II.6.8
- (47) Theorem II.6.11
- (48) Proposition II.7.2
- (49) Theorem II.7.3
- (50) Proposition III.1.5
- (51) Proposition III.1.9
- (52) Theorem III.2.6
- (53) Theorem III.2.8
- (54) Theorem III.2.11 and Proposition III.2.13
- (55) Lemma III.3.3 and the needed definitions.
- (56) Theorem III.3.5
- (57) Theorem III.3.7
- (58) Theorem IV.1.6
- (59) Lemma IV.1.11
- (60) Theorem IV.1.12: first and second part of the proof
- (61) Theorem IV.1.12: third part of the proof
- (62) Theorem IV.1.12: fourth and fifth part of the proof
- (63) Theorem IV.2.6