

Problem 1 (10 Points) Given that the linear combination of measurable functions is measurable, first show that the square of a measurable function is measurable, and use it to show that the product of two measurable functions is measurable.

Problem 2 (10 Points) State the simple approximation lemma and theorem.

Problem 3 (10 Points) State Littlewood's three principles, including the full statement of Egoroff's theorem.

Problem 4 (10 Points) State and prove Lusin's theorem.