

**Problem 1** (10 Points) State and prove Fatou's Lemma.

**Problem 2** (10 Points) State and prove the Monotone Convergence theorem.

**Problem 3** (10 Points) State and prove the Lebesgue Dominated Convergence theorem.

**Problem 4** (10 Points) State and prove the Vitali Convergence theorem for the general measure case.