MATH 340 – SPRING 2026 – SYLLABUS FOR MIDTERM 1

The first midterm will cover all topics discussed through the lecture of Thursday, February 5. This includes the following:

- Probability spaces, probability measures, De Morgan's laws.
- Basic counting techniques.
- Conditional probability, Bayes' rule.
- Independence of events.
- Random variables, pmf, cdf.
- Examples of common discrete random variables: Bernoulli, Rademacher, binomial, Poisson, geometric, negative binomial.
- Independence of random variables.
- Expectation, variance, covariance, and correlation of random variables.
- Markov's and Chebyshev's inequalities. Cauchy–Schwarz inequality.
- Joint distributions of random variables.
- Conditional distributions of random variables.
- Conditional expectations of random variables.
- Weak law of large numbers.
- Sterling's formula (statement).
- Central limit theorem for sums of Rademacher random variables.

You should know all of the definitions and theorems given in the lectures, and know how to solve all of the homework problems. I also posted some practice problems which I hope will be good practice, but I won't specifically expect that you have solved them for the midterm.