Study Guide for the Final

$29 \to 24 \to 25 \to 23 \to 26 \to 32 \to 33 \to 34 \to 25.2 \to 31$

1 Definitions to remember

1. *"Old" definitions:* Remember all definitions introduced this semester *exactly* and most definitions introduced in MATH 6101 *essentially.* (Ross' book only.) I will not ask any direct question in the mandatory part on "old" definitions, but I might take off points if I detect that you do not remember them correctly.
2. *New definitions:* Definition 29.6 (increasing and decreasing functions), Definitions 24.1 and 24.2 (pointwise and uniform convergence), Definition 25.3 (uniformly Cauchy sequences), Definition 32.1 (*all terminology connected to Darboux and Riemann integrals*), Definition 32.6 (mesh), Definition 32.8 (Riemann sum), Definition 31.2 and 31.8 (Taylor series *centered at any number*).

2 Statements you should remember with their proof

1. From the book: Theorem 29.1 (derivative is zero at max and min), Theorem 29.2 (Rolle's Theorem), Theorem 29.3 (Mean Value Theorem), Corollaries 29.4 and 29.5 (antiderivative is well-defined up to a constant term), Theorem 23.1 (radius of convergence for power series), Theorem 24.3 (uniform limit of continuous functions is continuous), Lemma 26.3 (derivation or integration does not change the radius of convergence), Lemma 32.2 (refining a partition, picture suffices), Lemma 32.3 (any $L(f,P)$ is $\leq$ any $U(f,Q)$), Theorem 32.4 ($L(f) \leq U(f)$), Theorem 32.5 (rephrasing of Darboux integrability), Theorem 33.9 (Intermediate Value Theorem for integrals), Theorem 34.1 (Fundamental Theorem of Calculus I), Theorem 25.2 (integrating a uniform limit).

3 Statements and methods you should know (without proof)

1. From the book: Corollary 29.7 (connections between monotonicity and the sign of the derivative), Theorem 29.9 (derivative of the inverse), Theorems 25.4, 25.5, and 25.6 (uniformly Cauchy sequence has a limit to which it converges uniformly, same for series), Theorem 25.7 (Weierstrass M-test), Theorem 26.1 (convergence of a power series is uniform on $(-R_1, R_1)$, for any $R_1 < R$) Corollary 26.2 (power series converges to continuous function), Theorems 26.4 and 26.5 (term by term integration and differentiation), Theorem 26.6 (Abel's Theorem), Theorem 32.7 (integrability in terms of the mesh), Theorem 32.9 (equivalence of Riemann and Darboux integrals), Theorem 33.1 and 33.2 (monotone or continuous functions on a closed interval are integrable), Theorem 33.3 (integrating sums and constant multiples), Theorems 33.4 and 33.5 (monotonicity of the integral operation), Theorem 33.6 (integrating on $[a,c] \cup [c,b]$), Theorem 34.2 (Integration by Parts), Theorem 34.3 (Fundamental Theorem of Calculus II), Theorem 34.4 (Change of Variable), Theorem 31.3 (Taylor's theorem), Theorem 31.7 (Binomial series).
2. From the lecture: methods to integrate trigonometric polynomials and rational functions.

4 What to expect

The exam will be *closed book.* The above guide is meant to help with the mandatory part. For the optional part prepare as if it was another midterm. The mandatory part will be as long as the midterm, the optional part will have only about 5 questions.