

Study Guide Exam 3 (Final Exam)

The final exam—exam 3—will be on August 3 in the usual room at **10:30am**. Please do not miss it since I will not let you take it later.

This exam will be comprehensive, covering material from the entire semester. The exam will have two parts: the first part will be multiple choice and calculators *will not* be allowed; the second part will be free response and calculators *will* be allowed. Since there are 2 hours allotted for the exam, there will be more questions. There will be 20–30 multiple choice questions and 4–8 free response. I have not decided on the exact number of questions, but the overall point value of the final is 100 points.

The main concepts of this semester are functions, limits, exponential/logarithmic functions, and the derivative. The relevant sections from the book are listed below.

Review exams 1 and 2, the sample tests, old activities, quizzes, and homework.

Functions (§0.1–0.7) What is a function? What are the domain and range of a function? What is the natural domain? What is the graph of a function? What is the vertical line test? What is a piecewise function? Can you evaluate a function given by a formula? What is a linear function? What is the slope of a line? What line goes through two given points? What is a quadratic function? Where is the vertex of a quadratic function? What is a polynomial? How does a given polynomial behave as $x \rightarrow \infty$ and $x \rightarrow -\infty$? What is a rational function? What is the natural domain of a given rational function?

Limits (§1.1–1.3) What is a limit? What are one-sided limits? When does a limit exist? Does a function need to be equal to its limit at a given point? What are the limit rules (i.e. $\lim cf(x) = c \lim f(x)$)? Where are the vertical asymptotes—if any—of a rational function? Can you calculate the horizontal asymptotes of a given function? What is continuity? What is the intermediate value theorem (IVT)? How can the IVT be used to find the roots of a continuous functions? Where is a polynomial continuous? Where is a rational function continuous? Given a graph, can you identify limits from it?

Exponential/Logarithmic Functions (§2.1–2.4) What is an exponential function? What are the exponent rules for manipulating exponents? How do you write $\sqrt[3]{a}$ as an exponent? What do the graphs of exponential functions look like? How do you model a word problem as an exponential function (both growing and decaying)? What is compound interest? How do you calculate the future value of an account with compound interest? What is the definition of e ? Of e^x ? What is the inverse of exponentiation? What is a logarithm? How are logarithms and exponentials related? What are the logarithm rules? Can you solve equations with exponentials and logarithms? What do the graphs of exponential and logarithmic functions look like?

Derivatives (§3.1–3.7) What is the definition of the derivative? How can one interpret the value of the derivative at a point? What is the power rule? The sum rule? The product rule? The quotient rule? The chain rule? Can you use these rules to find derivatives? What is the derivative of e^x ? Of $\ln x$? Can you use linear approximation to estimate values of a function? What is the relationship between position, velocity, and acceleration?

Using Derivatives (§4.1-4.5) Can you draw the derivative of a function given the graph of the function? How about vice-versa, draw a function given its derivative? How does the derivative signal when a function is increasing or decreasing? Can you find the critical points of a function? When are those critical points local maxima or minima? What is concavity? What are inflection points? Can you sketch the graph of a function using only information from the derivative? Can you solve word problems involving optimization?