

The Final Exam covers Sections 4.6 (Optimization), 4.7 (Business and Economics), 4.9 (Antiderivatives), 5.1 (Areas and Distances), 5.2 (Definite Integral), 5.3 (Evaluating Definite Integrals), 5.4 (FTC), 5.5 (Substitution Method). Pay particular attention to the Suggested Exercises and to definitions.

Section 4.6: Study the worked examples and the suggested exercises in this section. For each problem, draw a diagram, assign variables, express relations among the variables, formulate the problem as finding the max or min of a function of one of the variables over some specific interval.

Section 4.7: Know the vocabulary of economics, such as cost, marginal cost, average cost, revenue, marginal revenue, profit, etc. Study the worked examples and suggested exercises in the section.

Section 4.9: Know the definition of antiderivative, and that an antiderivative is determined up to adding a constant. Study how a specific antiderivative is determined by a value at some point. Study applications to displacement and distance travelled. Study examples and suggested exercises.

Section 5.1: Know the definition of the area under the graph of a positive function  $y = f(x)$  over an interval  $a \leq x \leq b$ . Know the sigma notation and how to use it to express an approximation to this area by rectangles over subintervals obtained by dividing the interval into  $n$  equal subintervals, and using the value of  $f$  at left endpoints (or right endpoints, or midpoints). Study the examples and suggested exercises.

Section 5.2: Know the definition of the Riemann integral of a function over a closed bounded interval. Know the definition of a Riemann sum. How is the integral related to the signed area between the graph and the  $x$ -axis?

Section 5.3: Know how to use the Evaluation Theorem to evaluate integrals. Study the suggested exercises.

Section 5.4: Know the Fundamental Theorem of Calculus (FTC). Study the proof given in class and in the text. Notice how the proof (given in class and in the text on pages 382-383) begins with the difference quotient of the definition of the derivative. Study the suggested exercises, especially the graphical ones, and those for which the variable limit on the integral is not just  $x$ , but some function of  $x$ .

Section 5.5: Know the substitution method for evaluating indefinite and definite integrals. Study the suggested exercises, especially those done in class.