

# Study guide midterm no. 1

## Quantitative Analysis, 1100-1/2

Spring 2008, Arend Bayer

The midterm will cover sections 9.1-10.4. A good check list for review are the "Key Terms and Formulas" at the end of chapter 9 and 10. You should also go through the quizzes and make sure that you can do similar problems; a majority of the problems in the midterm will be similar to one of the problems in the quizzes.

All the problems listed below refer to *Review Exercises* at the end of chapter 9 and 10.

**You will be allowed to bring one sheet of paper with your own hand-written notes to the exam.**

### 1. LIMITS

You have to remember there are two different strategies to compute limits of fractions:

- For *finite* limits, e.g.  $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x - 3}$  you have to check whether the denominator becomes zero, then factor out  $x - 3$  if possible, etc. [See box at bottom of page 588.]
- For limits at infinity, you divide by the highest power in the denominator and evaluate, see e.g. 9.2 example 4.

Example problems are chapter 9, no. 7–16, 19–20 and 37–38.

1.1. **Continuity.** There may be a problem of the following types: "Find all points where a function  $f$  is discontinuous" (or: "Decide whether the following function is continuous."). Examples are 9, no. 25–30 and 31–34.

### 2. COMPUTING DERIVATIVES

2.1. **What you need to know.** Limit-Definition of derivative; obviously all derivative formulas of sections 9.4–9.6.

#### 2.2. Problems.

Definition. There will almost certainly be one problem where you have to compute a derivative from scratch, using the definition via limit of average rates of change (see Procedure/Example box on page 613). Example problems are 9.40–43.

Computing derivatives. All review exercises for sections 9.4–9.8 are good example problems. Try to make sure you are confident with these, not only getting the idea right but also all the messy details...

### 3. USING DERIVATIVES IN PURELY MATHEMATICAL PROBLEMS

3.1. **Need to know.** Procedures to find relative minima/maxima (see page 694 and page 712), and to find inflection points (page 709).

3.2. **Example problems.** 10.1–15.

## 4. USING DERIVATIVES IN APPLICATION PROBLEMS

4.1. **Computing marginal cost/revenue/profit function and use it.**

Example problems for this are 9.100–107.

4.2. **“Physics” examples.** Recall: If  $s(t)$  is the position of a particle, then  $\frac{ds}{dt}$  is the velocity (after time  $t$ ), and  $\frac{d^2s}{dt^2}$  the acceleration. E.g. problem 9.98.

4.3. **Optimization in business and economics.** There will be at least one problem (more likely two) in the midterm asking you to maximize a revenue or profit function, or to minimize an average cost. Remember that you can always compute the revenue from the demand function by “revenue is number of units sold times price per unit”, and of course the profit is always “revenue minus cost”. Example problems are 10.31–38, 10.40–44.

4.4. **Other optimization.** There will be one problem related to other optimization, i.e. section 10.4. 10.45, 10.48–50.