

550.251 Spring 2008 Exam III Review Guide

This document is intended to be a study guide only. You are responsible for ALL the material covered from 3/31/08 to 5/02/08 (unless an exclusion is mentioned below). This includes material from lecture, section, assigned reading, handouts, and Homeworks 6 through 8. The following is a summary (not necessarily exhaustive) of the material covered.

WARNING: It should be understood that you are expected to be familiar with ALL the material covered from 1/28/08 to 5/02/08.

This exam is closed book, no calculator. You may bring a ruler.

Cheat Sheet. You are allowed one 8.5x11 page of notes, front and back. Your notes should be your OWN work. They may be handwritten or typed (by yourself) but NOT a photocopy of material you did not write or type out yourself.

J-CARD. IMPORTANT!! Please bring your student ID card to the exam.

Nonlinear Optimization Models (Chapter 7)

General: The student should be able to formulate a problem with a nonlinear objective function and/or constraints.

1. Two variable unconstrained problem: be able to find local optima by hand using 1st derivatives and second derivative test.
2. Key terms: partial derivative (e.g., $\partial f/\partial x$, $\partial^2 f/\partial y^2$, $\partial^2 f/\partial x\partial y$, etc.), critical point (where all first derivatives are zero), gradient, Hessian, global optimum, local (relative) optimum, convex function, concave function
3. Application: Regression Models. Be able to find the normal equations (which can be solved to determine the parameter values for the regression model). Be able to set up the optimization problem that describes how to find the least-squares regression model.

Inventory Models (Chapter 13)

General: The student should be able to use a total variable cost function for simple inventory models given a graph of the inventory profile over time. Using calculus, the student should be able to identify critical points for the cost function and determine if a critical point constitutes an optimal solution for inventory model.

1. Components of an inventory policy (Q and R)
2. Types of costs: holding, order/setup, procurement / manufacturing,
3. Key Terms: lead time, total annual costs, total variable costs, cycle time, number of orders per year, reorder point
4. EOQ model assumptions; sensitivity of EOQ optimal solution to variability in demand; calculation of reorder point for EOQ model
5. The following models in Section 13.4 are INCLUDED: Quantity Discounts, Shortages, Reducing Setup Costs
6. The following models in Section 13.4 are EXCLUDED: Synchronized Ordering
7. The following sections of Chapter 13 are EXCLUDED: 13.5–13.7
8. Inventory Models with Time Varying Demand (Case II) is EXCLUDED.

Integration (See Handout)

General: The student should be able to compute antiderivatives for powers of x and $e^{\alpha x}$

1. Key terms: indefinite integral, definite integral
2. Using the definite integral to find the area under a curve
3. Using the definite integral to find the average value of a function over an interval (Used in inventory models)
4. Integration using simple substitution (see handout online)
5. Integration by parts
6. Using partial fractions to simplify an integrand

Exponents and Logarithms (Not in Text)

General: The student should be comfortable with the standard rules for manipulating exponents and logarithms:

The expression	Is equivalent to
$e^x e^y$	e^{x+y}
e^{-x}	$1/e^x$
$x^{1/n}$	$\sqrt[n]{x}$
$(e^x)^y$	e^{xy}
$\ln(xy)$	$\ln x + \ln y$
$\ln(x/y)$	$\ln x - \ln y$
$\ln x^n$	$n \ln x$

Separable Differential Equations (See Handouts)

The student should be able to solve separable 1st order differential equations and recognize applications for which such equations apply. These include:

- Natural Growth and Decay
 - Population Growth
 - Drug Elimination
 - Compound Interest
- Cooling and Heating
- Logistic Models of Population Growth & Spread of Disease

Compound Interest: A person investing P dollars at an interest rate r compounded annually will have $A = P(1 + r)^t$ dollars after t years. If interest is compounded m times a year with the person receiving r/m interest m times during the course of the year, then after t years, the person will have

$$A = P \left(1 + \frac{r}{m} \right)^{mt}$$

dollars. If interest is compounded continuously then after t years, the person will have $A = Pe^{rt}$ dollars.

First-Order Linear Differential Equations (See Handouts)

The student should be able to solve 1st order linear differential equations and recognize applications for which such equations apply. These include: personal finance models