

MATH 242 FINAL EXAM STUDY GUIDE

How to prepare for this exam:

1. Look over all of your old homework. Make sure that what you wrote down still makes sense.
2. Redo all of your quizzes. Even if you did them perfectly, redoing them will remind you about the different types of problems.
3. Read over your notes. There are many subtleties that are important to understand. Once you understand these then you understand the material much better.
4. Look over the Review section at the end of chapters 14 and 15.

Format for the midterm: **Multiple choice** (please bring pencil #2).

You will not be able to use your notes, or book on the exam. You can use one note card 3×5 inches with any formulas you wish.

Review questions:

- Page 1031: 1-7, 9, 27-30;
- Page 1098: 1-3, 6-9, 11, 13, 15, 17, 19-21.
- Assigned homework exercises

Vocabulary:

- improper integral
- differential equation
- simple differential equations
- separable differential equations
- general and particular solutions of differential equations
- function in two or three variables
- linear and interaction function in two or three variables
- distance function
- $3D$ space and graph of function in two variables
- partial derivative
- maxima and minima of functions of several variables
- critical points of functions of several variables
- second derivative test for functions of several variables
- maxima and minima of functions of several variables
- constrained optimization of functions of several variables
- Lagrange multipliers

1. CHAPTER 14

Sections 14.5, 14.6. Here are some things you should know:

- You should be able to recognize improper integrals with finite and infinite limits.
- You should be able to test the improper integrals for convergence and evaluate the convergent ones.
- You should be able to find general and particular solutions to separable differential equations.

2. CHAPTER 15

Sections 15.1, 15.2, 15.3, 15.4, 15.5. Here are some things you should know:

- You should be comfortable with functions in several variables, and be able to recognize linear and interaction functions.
- You should be familiar with the distance function.
- You should be able to plot points in the $3D$ space.
- You should be able to analyze the graph of a function in two variables by means of cross sections parallel to X , Y , and Z axes.
- You should be able to compute, and understand the meaning of partial derivatives including the second partial derivatives. You should be familiar with both notations $\frac{\partial^2 f}{\partial x^2}$, $\frac{\partial^2 f}{\partial x \partial y}$, $\frac{\partial^2 f}{\partial y^2}$ and f_{xx} , f_{xy} , f_{yy} .
- You should be comfortable with the chain rule for several variables.
- You should understand the interpretation of partial derivatives, especially in applications such as marginal cost.
- You should be able to find the critical points of a function in two variables, and use the Hessian $H = f_{xx}f_{yy} - (f_{xy})^2$ to determine whether such points are relative minima, maxima, or saddle points.
- You should be able to find the relative minima and maxima of a function subject to constraints, in particular, points on surfaces closest to the origin. You should be familiar with the technique of Lagrange multipliers.