

Math 1100
Practice Exam

1. Here are some problems from the text book that you should be familiar with for the final exam which are either word problems or related rates problems: example 4 on page 276, problem 258 on page 254, 37 and 35 on page 209, and example 3 on page 204. Students should use the exams and practice exams as a study guide and simulation of the material up to chapter 6.1. In particular you should be able to state the chain rule, product rule, quotient rule, use implicit differentiation, state the integration by parts formula, state and use the limit definition of derivative and partial derivative to calculate a derivative and partial derivative, state the definition of what it means to be continuous at a point and use this definition to determine if a function is continuous at a point or where it is continuous, classify discontinuities. You should be prepared for several more application problems on the final than has been on the exams. There was about 1 application problem on the exams there will be at least 3 or more application problems on the final exam. You should be at least be comfortable with the optimization problems referred to on the practice exam (in particular the ones listed above, and should be comfortable with maximizing profit as in section 3.5 problems 9-19 (you can do the odd ones) or finding a profit, revenue or cost function given marginal profit, revenue or cost, such example problems are 59, 60 on page 343 or example 9 on 325. Remark: these just list a few types of application problems you should be familiar with, and is not an exclusive list! Here are some practice problems for the material from 6.2-7.4.

2. Find the derivative of the following functions.

(a) $f(x) = \int_0^{x^2} e^{x^2} dx$

(b) $f(x) = \int_0^{e^{x^2}} x^2 + x dx$

3. Find the antiderivative of the following functions (you should also be familiar with the homework from section 6.2).

(a) $\int \ln(x) dx$

(b) $\int x^2 e^x dx$

(c) $\int x^5 e^{x^2} dx$

(d) $\int \ln(x^{\frac{1}{2}}) dx$

4. Calculate the value of the improper integral and determine if it converges or diverges.

(a) $\int_{-\infty}^{\infty} e^{|x|} dx$

(b) $\int_1^{\infty} x^{-\frac{1}{2}} dx$

(c) $\int_1^{\infty} x^{-2} dx$

(d) $\int_0^1 x^{-\frac{1}{2}} dx$

5. show that when labor and capital are doubled in the cobb-douglas production function from section 7.3 that output is also doubled.

6. evaluate $f(10, 10)$, $f(0, 10)$, $f(1, 5)$ where $f(x, y) = \int_x^y \frac{1}{t+2} dt$.

7. Sketch the level curves or contours of the following functions for the specified z-values.

(a) $z^2 + x^2 + y^2 = 1$ for $z = 0, 1$

(b) $e^z = xy$ for $z = 1, e, e^2, e^5$

8. State the limit definition of partial derivative with respect to x and also with respect to y (two separate definitions) and use that definition to calculate $f_y(x, y)$ (the partial derivative with respect to y) for the following functions.

(a) $f(x, y) = \frac{x^9}{x^2 + \ln(x)} + e^{x^{99}}$

(b) $f(x, y) = xy$

9. Find the partial derivatives $f_x, f_{xx}, f_{yy}, f_{xy}, f_{yx}, f_y$ of the following functions.

(a) $f(x, y) = \frac{x-y}{x^2+y^2}$

(b) $f(x, y) = \ln(xy)$

(c) $f(x, y) = y(x^2 + x + 4)^9 + (y^3 + 1)^3$

Also be familiar with problems 67-71 and 76 in section 7.4.