

# Math 140 – Final Exam Study Guide

Fall 2016, Prof. Beydler

## Final Exam

- Date: Monday, December 12, 2016 from 7:30pm to 10:00pm
- Will cover all sections in this class, though will slightly emphasize material covered after Test #3 (that is, 7.1 and after).
- The test will start at 7:30pm, and you'll have 2 hours and 30 minutes to finish it.
- No notes, no books, no phones during the final exam. For this test, you'll need a **scientific calculator**.
- As usual, there will be a seating chart for the final exam.
- Where to get help as you're studying:
  - Office hours
  - TMARC, LAC, or other tutoring centers
  - E-mail me at [dbeydler@mtsac.edu](mailto:dbeydler@mtsac.edu)

## Not on the test:

- Section 1.1-1.4
- Section 3.5.
- Sections 4.1-4.2
- Using the properties given on page 2 of the 5.3 Notes. (5.3)
- The average value of a function over an interval. (5.4)
- Section 7.4

## Some of the stuff on the test:

- How to take limits (regular, left, and right) of various functions (in both graphical and algebraic forms). (1.5, 1.6)
- Know how to find discontinuities of a function. (1.6)
- There will be one problem where you'll have to use the definition of the derivative to find the derivative (2.1). Be sure it's lodged in your brain (you'll get a point for at least writing the definition down as shown below):
$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$
- Know **how** take derivatives using the Constant, Power, Constant Multiple, Sum, Product, Quotient, and Chain rules. Just as important, know **when** to use these rules (this part takes practice). (2.2, 2.3, 2.4)
- Know how to find/use marginal revenue, marginal cost, and marginal profit. (2.5)
- Know how to find  $\frac{dy}{dx}$  using implicit differentiation (2.6).
- There will be a related rates problem from 2.6.
- Use the first derivative to find intervals of increase and decrease, as well as relative max/mins. (3.1)
- Use the second derivative to find concavity and inflection points. (3.2)
- Use calculus to sketch curves. (3.3 and 4.4)

- Know how to find the absolute max/min of a function (if closed interval, test endpoints; if not and only one critical number, use Second Derivative Test for Absolute Extrema). (3.4)
- Know how to take derivatives of functions that have exponentials and logarithms in them. Also know how to use logarithmic differentiation. (4.3)
- Find indefinite integrals (remember “+C”) and definite integrals (use  $F(b) - F(a)$ ). You’ll be given an integral and will have to determine yourself which method is appropriate/best. Aside from the common integrals rules (see 5.1 Notes, page 1), you’ll need to know how to use integration by substitution (5.2) and integration by parts (6.1).
- Given slope of tangent line, find the function that passes through a given point. (5.1)
- There will be one problem where you have to solve a differential equation, or one where you have to solve an initial value problem. (5.1, 5.2)
- Find the area between curves. (5.4)
- There will be a consumer/producer surplus type of problem—guaranteed. (5.5)
- Know how to use the trapezoidal rule and Simpson’s rule for approximating integrals—see given formulas below. (6.2)
- Evaluate improper integrals, or show that they diverge. (6.3)
- Find the domain of a function in several variables. Also evaluate them at given points. (7.1)
- Find first-order and second-order partial derivatives of functions in two variables. (7.2)
- There might be a substitute/complementary commodities problem. (7.2)
- Find critical points of a two-variable function and classify each as a max, min, or saddle point. (7.3)
- Use the Lagrange multiplier method to find the max/min values of a function  $f(x, y)$  subject to a constraint  $g(x, y) = k$ . (7.5)
- Evaluate double integrals. (7.6)

### Formulas given on test:

- Trapezoidal rule:  $\int_a^b f(x) dx \approx \frac{\Delta x}{2} [f(x_1) + 2f(x_2) + \cdots + 2f(x_n) + f(x_{n+1})]$
- Simpson’s rule:  $\int_a^b f(x) dx \approx \frac{\Delta x}{3} [f(x_1) + 4f(x_2) + 2f(x_3) + 4f(x_4) + \cdots + 2f(x_{n-1}) + 4f(x_n) + f(x_{n+1})]$

### Extra Credit!

- If you write up the answers to all of the review exercises (see Final Exam Review Exercises on the class website), and hand them in at the test, you can earn up to 3% extra credit towards your test (depending on neatness and completeness)! These review exercises don’t cover everything.
- If you go to the TMARC/LAC for 4 hours between Test #3 and the Final Exam, you’ll get 1% extra credit towards the Final Exam.