Mathematics 131 – Calculus for Physical and Life Sciences 1
Exam 3 – Things to Know
November 22, 2004

General Information

- The third exam of the semester will be given on Wednesday evening, December 1 at 6:00pm, in Haberlin 103 (the large lecture hall on 1st floor Haberlin). You will have until 7:30pm to work on the exam if you need that much time.
- Alternate time for those who have conflicts: Wednesday evening, December 1, 7:30pm - 9:00pm. If neither time works for you, contact me as soon as possible to arrange for another time to take the exam.
- This exam will cover the material we have studied since the second exam – Sections 6-10 in Chapter 3, and sections 1,2,5 in Chapter 4 in the text. (See below for a more detailed breakdown of the topics to know.)
- A basic scientific (non-graphing) calculator will be provided for your use on the exam.
- You will not be allowed to use cell-phones, computers, or any other electronic devices during the exam. Please do not bring them with you; they will be subject to confiscation for the period of the exam if you use them.

We will review for the exam in class on Tuesday, November 30.

Material To Know

You should know the following topics (in addition to basic derivative rules from earlier in the semester, of course!):

A) Section 3.6: The method of deriving derivative formulas for inverse functions using the chain rule. Also derivatives of $\ln(u), \log_a(u), \arcsin(u), \arctan(u)$. Related rates.

B) Section 3.7: Implicit differentiation. Know how to differentiate implicitly given $f(x, y)$, also how to get tangent lines to implicitly defined curves.

C) Section 3.8: Parametric curves. Know the basic idea of describing motion in the plane via parametric equations, how to combine graphs of $x(t)$ and $y(t)$ versus t to sketch a parametric curve, how to compute speeds and slopes, also know the "standard" parametrizations for lines, circles, ellipses, and how to use them.

D) Section 3.9: Know how to use the linear function defining the tangent line to a graph $y = f(x)$ at $x = a$ to approximate values of f near $x = a$.

E) Section 3.10: Know how to use L'Hopital's Rule to evaluate limits of "0/0" and "∞/∞" indeterminate forms. Also know how to use L'Hopital to compare rates of growth of functions as $x \to \infty$.

F) Section 4.1: Know: The language of critical points, local maxima and minimal, inflection points; How to find these using the first and second derivatives; The first and second derivative tests for critical points.

G) Section 4.2: Finding critical points, etc. in families of curves.

H) Section 4.3: Optimization for $f(x)$ on closed intervals – know how to find local maxima and minima as in 4.1 above, then compare the function values at those points with values at the endpoints to find the overall maximum and minimum on an interval.

I) Section 4.5: Applied optimization story problems. Know how to set up and solve questions like ones from Problem Set 11.

Some Good Review Problems

Section 3.8/3, 11, 13, 15, 27, 31 (what xy equation is satisfied by all of these?)

Section 3.10/5, 7, 9, 11

From the Review problems at the end of Chapter 3: All the problems 1-52 should be functions you can differentiate now. To keep your skills sharp, pick a "representative sample", 55, 57, 77,

Section 4.5/5, 6, 7, 8, 15, 21

From the Review problems at the end of Chapter 4: 1, 3, 5, 7, 9, 23, 24, 27

The "Check Your Understanding Problems" at the end of Chapter 3 and Chapter 4 are also very good for studying.