Mathematics 131 – Calculus for Physical and Life Sciences 1
Exam 1 – Things to Know
September 17, 2004

General Information

- The first exam of the semester will be given on Wednesday evening, September 22 at 6:00pm, in Haberlin 103 (the large lecture hall on 1st floor Haberlin), subject to approval of the Registrar. 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, September 22, 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 start of the semester – sections 1 - 6 of Chapter 1 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. Some questions will ask you to determine possible formulas for given graphs based on the properties of the "library of functions" we have studied in class. *Be prepared for questions of this type.*
- You will not be allowed to use cell-phones, computers, or other electronic devices during the exam. If you bring your cell-phone, please *turn it off* before the exam is handed out.

We will review for the exam in class on Wednesday, September 22 or possibly Tuesday, September 21 if people prefer.

Material To Know

You should know the following topics:

A) Functions, linear functions and their properties (Section 1.1)

1) The domain and range of a function, and how to determine them from a graph or formula.
2) The slope-intercept ($y = mx+b$) and point-slope ($y-y_0 = m(x-x_0)$) forms for linear functions
3) The meaning of the slope and how to determine it from either a formula for the function, or from a table of values

B) Exponential functions and their properties (Section 1.2)

1) The general formula for exponential functions $f(x) = ca^x$ (or using different letters, $P(t) = P_0a^t$, as on page 11 of the text).
2) Exponential growth versus exponential decay (which values of a give which case)

3) Be able to determine an equation for an exponential function, given a graph or a table of values.
4) How to tell exponential functions apart from linear functions
5) How to use exponential functions to model quantities that are growing or decaying at a constant rate

C) New functions from old via horizontal and vertical shifting, or stretching/shrinking (Section 1.3)

D) Composition of Functions, Inverse functions. (Section 1.3) Know:

1) How to compute a composition $f(g(x))$ and identify when a function is formed this way.
2) How to tell whether or not a function is invertible from its graph, how to derive a formula for the inverse function f^{-1} from a formula for f, and how to sketch the graph of the inverse function from the graph of f.

E) The logarithm functions $f(x) = \log_a(x)$ and their properties (Section 1.4)

1) $g(x) = \log_a(x)$ is the inverse function of the exponential function $f(x) = a^x$.
2) Formulas for logs of products, quotients, powers and how to apply them
3) The shapes of the graphs $y = \log_a(x)$
4) Using logarithms to solve equations involving exponentials, including in "story problems" on quantities that are growing or decaying at a constant rate
5) The *naturallogarithm* function $f(x) = \ln(x)$ (the logarithm function with base $a = e = 2.71828...$)

F) Trigonometric functions (Section 1.5). Know:

1) Radian measure for angles and how to determine the values of $\sin(t)$, $\cos(t)$, $\tan(t)$ for an angle t in radians
2) How to sketch graphs for sinusoidal oscillations $y = A\sin(Bx)+C$ or $y = A\cos(Bx)+C$ and the meanings of A, B, C
3) How to find a formula for a sinusoidal oscillation, given the graph.

G) Power, polynomial, and rational functions (Section 1.6) Know:

1) How to find x and y-axis intercepts, "end behavior", etc. from the formula
2) How to to find a formula for a polynomial or a "simple" rational function, given the graph.

Some Good Review Problems

From the Review problems at the end of Chapter 1: 1, 2, 6, 7, 8, 11, 15, 22, 23, 26, 27, 31, 33, 35, 37, 38.

The "Check Your Understanding Problems" at the end of Chapter 1 are also very good for studying.