Math 131-01, Spring 2011 — Third Test Info

The third test for this course will be given in class on Monday, April 11. The test covers the parts of Chapter 7 and of the first two sections of Chapter 8 that we have covered in class or in lab. This includes material on integration by parts, integrals involving trig functions, the basics of trig substitution, partial fractions for linear factors only, improper integrals, just the most basic ideas about numerical integration techniques and their errors, exponential growth and decay, simple differential equations and initial value problems, infinite sequences and their limits. You do not need to memorize any formulas for numerical integration techniques. You do not need to memorize any trig formulas except for the most basic one: $\cos^2\theta + \sin^2\theta = 1$. It is possible that you will need L'Hôpital's rule for computing limits.

I should be in my office on Thursday from 1:30 to 4:00 and on Friday from 10:10 to 2:50. I should also be there on Saturday from about 11:00 until 3:00.

You will not need a calculator for the test. A basic non-graphing calculator will be provided to you, and you will be permitted to use only the calculator that is provided. Scrap paper will also be provided. All you need is a pencil or pen.

Here are some terms and ideas that you should be familiar with for the test:

differential equation

solving a differential equation by separation of variables

initial value problem

exponential growth ($y(t) = Ae^{kt}$) and decay ($y(t) = Ae^{-kt}$)

doubling time and half-life

growth and decay problems (such as finding k, half-life, or $y(t)$ at some given time)

integration by parts: $\int u\,dv = uv - \int v\,du$

using repeated integration by parts

reduction formulas

using trig identities for integrals of the form $\int \sin^n(x)\cos^m(x)\,dx$

trigonometric substitution: using $x = a\sin(\theta)$ in integrals that contain $a^2 - x^2$

trigonometric substitution: using $x = a\tan(\theta)$ in integrals that contain $x^2 + a^2$

finding other trig functions of θ, given one function (e.g., find $\tan\theta$ given $\sin\theta$)

partial fraction decomposition of $\dfrac{p(x)}{q(x)}$, where $q(x)$ factors into linear factors

using partial fractions to integrate rational functions

why numerical integration is necessary

why being able to estimate the error in numerical integration is important

improper integrals on infinite domains: $\displaystyle\int_a^\infty f(x)\,dx$, $\displaystyle\int_{-\infty}^b f(x)\,dx$, and $\displaystyle\int_{-\infty}^\infty f(x)\,dx$,

improper integrals of unbounded functions, such as $\displaystyle\int_0^1 \ln(x)\,dx$

why improper integrals are "improper"

infinite sequences: $a_1, a_2, \ldots, a_n, \ldots$

the notation $\{f(n)\}_{n=1}^\infty$ or $\{f(n)\}_{n=0}^\infty$

defining an infinite sequence with a recurrence relation such as $a_n = \frac{1}{2}a_{n-1} + 1$

the limit of an infinite sequence, $\displaystyle\lim_{n\to\infty} a_n$

convergent sequence (limit exists)

divergent sequence (limit does not exist, including the case of an infinite limit)

properties of limits of sequences, such as $\displaystyle\lim_{k\to\infty}(a_k + b_k) = (\lim_{k\to\infty} a_k) + (\lim_{k\to\infty} b_k)$

monotonic sequence (non-increasing or non-decreasing)

a bounded monotonic sequence converges

geometric sequence, $\{r^n\}_{n=1}^\infty$, where r is a constant

$\{r^n\}_{n=1}^\infty$ converges to 0 if $-1 < r < 1$, converges to 1 if $r = 1$, and diverges otherwise