Math 131-01, Spring 2011 — Second Test Info

The second test for this course will be given in class on Wednesday, March 9. It covers Chapter 6, Sections 1 through 6 (omitting a few topics in Section 6—pressure and varying force).

The test is on applications of integration. The largest part of the test will be about using integration to compute various quantities, such as displacement, area, volume, arc length, mass, and work. In some cases, you will only be asked to set up an appropriate integral. In others, you might be asked to evaluate the integral. There could be some questions on approximation with Riemann Sums.

The test will also include some "short essay" questions that ask you to define or explain something, to test that you have an understanding of the material that goes beyond just being able to apply formulas that you have memorized. One thing that you need to understand is how the formulas are derived from Riemann Sum approximations.

The test covers Chapter 6, but can, of course, require some material from Chapter 5. In particular, you should still know all the basic indefinite integral formulas, and you should be prepared to use substitution to solve an integral, if necessary.

I should be in my office this week on Monday from 10:00 to 2:50 and Tuesday from 9:30 to 4:00. There is homework due on Monday; if you would like to get it back before the test, you should be able to pick it up in my office on Tuesday.

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:

displacement ($\int_a^b v(t)\,dt$)

speed ($|v(t)|$), and distanced traveled ($\int_a^b |v(t)|\,dt$)

postion from velocity, using $s(b) = s(a) + \int_a^b v(t)\,dt$)

velocity from acceleration, using $v(b) = v(a) + \int_a^b s(t)\,dt$

general "future value" formula: $f(t) = f(a) + \int_a^t f'(x)\,dx$

applications of "future value" to quantities such as population growth

areas of regions between curves

integration with respect to x (using vertical lines through the region and dx in the integral)

integration with respect to y (using horizontal lines through the region and dy in the integral)

volume as integral of cross-sectional area, $V = \int_a^b A(x)\,dx$ or $V = \int_c^d A(y)dy$

volumes of solids of revolution: disks, washers, or shells (using dx or dy)

rotating around a line other than the x- or y-axis

general disk/washer formula w.r.t. x: $\int_a^b \pi R^2 - \pi r^2\,dx$, where R and r are functions of x

general disk/washer formula w.r.t. y: $\int_c^d \pi R^2 - \pi r^2\,dy$, where R and r are functions of y

general cylindrical shell formula w.r.t. x: $\int_a^b 2\pi rh\,dx$, where r and h are functions of x

general cylindrical shell formula w.r.t. y: $\int_c^d 2\pi rh\,dx$, where r and h are functions of y

arc length, $\int_a^b \sqrt{1 + (f'(x))^2}\,dx$

linear density of a “one-dimensional object”

constant density formula: mass $=$ density $*$ length

mass from varying density: $\int_a^b \rho(x)\,dx$

constant force formula for work: work $=$ force $*$ (distance traveled)

the force due to gravity acting on a mass m near the Earth’s surface: gm, where $g = 9.8$

work done in lifting a mass m by a vertical distance y: gmy

lifting problems: work $= \int_c^d \rho g A(y) D(y)\,dy$

finding areas and volumes of “infinite” objects