The second test for this course will be given in class on Wednesday, March 22. From the textbook, the test will will cover Sections 6.1 thorough 6.5, 7.1, 7.2, and 7.5. In class, we also covered material from 6.8 and 7.4, but those sections will not be on the test. The test might also include some ideas that were covered in labs. See the full list of topics below.

You can expect any test that I give to include some "short essay" questions that ask you to define something, discuss something, explain something, state a theorem, and so on. There might be one longer essay that requires more depth of understanding. Other than that, most of the questions will be similar to problems that you have seen on the homework, in lab, or in class.

You can expect a number of problems that ask you to set up integrals without evaluating them. Other problems will ask you to evaluate integrals. You can expect that in many cases, you will be told which method of integration to uses. However, you might also see problems where you are just given an integral, and you need to decide which method to apply.

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:

area between the curves $y = f(x)$ and $y = g(x)$ on an interval $a \le x \le b$

finding area by integrating with respect to y instead of x

slicing: volume can be computed as an integral of cross section area

solids of revolution, formed by rotating a region about a line

methods for computing the volume of a solid of revolution:
- disks
- washers
- shells

rotating about lines other the x-axis and y-axis

dealing with more complex regions

defining volume as a limit of Riemann sums

approximating a volume as a limit of Riemann sums

length of a curve $y = f(x)$ for $a \le x \le b$

finding volume by integrating with respect to y instead of x

meanings and justifications for the volume and arc length formulas

substitution ("change of variables") in indefinite and in definite integrals

substitutions that "always work" in that you can write everyting in terms of u,
such as: $u = ax + b$, $u = e^{ax}$, $u = \sqrt{x}$

basic trig identity: $\sin^2(x)+\cos^2(x) = 1$, so $\cos^2(x) = 1-\sin^2(x)$ and $\sin^2(x) = 1-\cos^2(x)$

integration by parts

reduction formulas, and how to use them

partial fractions (limited to no repeated roots and at most one quadratic)

Here are some formaulas that you should know:

area between $y = f(x)$, $y = g(x)$, $a \leq x \leq b$, if $g(x) \leq f(x)$: $\displaystyle\int_a^b f(x) - g(x)\,dx$

volume when area under $y = f(x)$, $a \leq x \leq b$ is rotated about x-axis: $\displaystyle\int_a^b \pi(f(x))^2\,dx$

volume when area under $y = f(x)$, $0 \leq a \leq x \leq b$ is rotated about y-axis: $\displaystyle\int_a^b 2\pi x f(x)\,dx$

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

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

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

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

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

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

partial fractions for n distinct linear factors, where degree of numerator $< n$:

$$\frac{f(x)}{(x-r_1)(x-r_2)\cdots(x-r_n)} = \frac{A_1}{x-r_1} + \frac{A_2}{x-r_1} + \cdots + \frac{A_n}{x-r_1}$$

partial fraction for an irreducible quadratic term: $\dfrac{Ax+B}{x^2+bx+c}$

Integrals (if you need any other basic integrals, they will be given to you):

$\int x^k\,dx = \frac{x^{k+1}}{k+1} + C \quad (k \neq -1)$

$\int \frac{1}{ax+b}\,dx = \frac{1}{a}\ln|ax+b| + C$

$\int e^{ax}\,dx = \frac{1}{a}e^{ax} + C$

$\int \sin(ax)\,dx = -\frac{1}{a}\cos(ax) + C$

$\int \cos(ax)\,dx = \frac{1}{a}\sin(ax) + C$

$\int \sec^2(x)\,dx = \tan(x) + C$

$\int \tan(x)\sec(x)\,dx = \sec(x) + C$

$\int \frac{1}{x^2+1}\,dx = \tan^{-1}(x) + C$

$\int \frac{1}{\sqrt{1-x^2}}\,dx = \sin^{-1}(x) + C$
