92.231 Calculus III Spring 2003
Review Sheet for Exam #3
Necessary Skills

Section	You should be able to
12.3	• represent the volume of a solid as a double integral • evaluate a double integral over a nonrectangular region by representing it as an iterated integral • sketch the region of integration and change the order of integration of a given iterated integral
12.4	• evaluate a double integral by representing it as an iterated integral using polar coordinates
12.5	• find the mass, center of mass, and moments of inertia of a given region in the xy plane, given the density function ρ
12.6	• find the area of a surface described parametrically • find the area of a surface described by the equation $z = f(x, y)$
12.7	• evaluate a triple integral by representing it as an iterated integral in Cartesian coordinates • find the mass, center of mass, and moments of inertia of a given region in space, given the density function ρ
12.8	• evaluate a triple integral by representing it as an iterated integral in cylindrical coordinates • evaluate a triple integral by representing it as an iterated integral in spherical coordinates
13.1	• sketch a given two-dimensional vector field • find the gradient of a given scalar function
13.2	• evaluate the line integral of a given function along a given curve • calculate the work done by a given force on an object moving along a given curve

Answers to Practice Exam Questions

1. b) 1
2. $1 - \dfrac{\sqrt{2}}{2} \approx 0.29289$
3. $50/3$
4. $\dfrac{9\pi}{2} + \dfrac{\pi^2}{8} \approx 15.371$
5. $8\pi/3$

Calculus III Practice Exam #3 Spring 2003

There is no guarantee that the actual exam will bear any resemblance to this practice exam. The purpose of the practice exam is to give you an idea of the approximate length and the type of problem that you can expect on the actual exam.

Problem #1 (20 points)

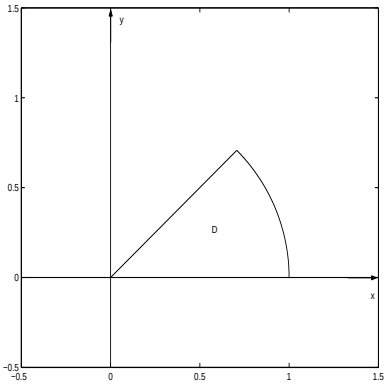
Let D be the triangular region with vertices $(0,0), (0,2),$ and $(1,0)$.

a. Sketch the region D.

b. Evaluate $\iint_D 3x \; dA$.

Problem #2 (20 points)

Let D be the region in the first quadrant bounded by the x axis, the line $y = x$, and the circle $x^2 + y^2 = 1$. (See the figure below). Use polar coordinates to evaluate $\iint_D 3y \; dA$.



Problem #3 (20 points)

Find the volume of the solid above the xy plane, below the surface $z = 9 - x^2$, and bounded on the sides by the planes $x = 0$, $y = x$, and $y = 2$.

Problem #4 (20 points)

Find the work done by the force field $\mathbf{F}(x, y, z) = \langle -z, y, x \rangle$ in moving a particle from the point $(3, 0, 0)$ to the point $(0, \pi/2, 3)$ along the helix $x = 3\cos(t),\ y = t,\ z = 3\sin(t)$.

Problem #5 (20 points)

Evaluate $\iiint_E 2z \; dV$, where E is the region above the plane $z = 0$ and below the cone $z = 2 - \sqrt{x^2 + y^2}$.
(Hint: Show that the curve of intersection of the plane $z = 0$ and the cone $z = 2 - \sqrt{x^2 + y^2}$ is the circle $x^2 + y^2 = 4$ in the xy plane.)