

Last Name: _____

First Name: _____

Math 21a Exam #2: Monday, April 13, 1998

SECTION (CIRCLE ONE):

Brad Mann
Alex Lee (CA)
MWF 10-11

Brad Mann
Mike Brauerman (CA)
MWF 11-12

Christine Taylor
Andreea Boca (CA)
TTh 10-11:30

Martijn Wijnholt
Carina Curto (CA)
TTh 11:30-1

Robert Winters
Eben Kenah (CA)
MWF 10-11

Robert Winters
Shan Mishra (CA)
MWF 11-12 (Physics)

Robert Winters
Carrie Snyder (CA)
MWF 12-1

Question	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	Skip for
Total	100	spring 02

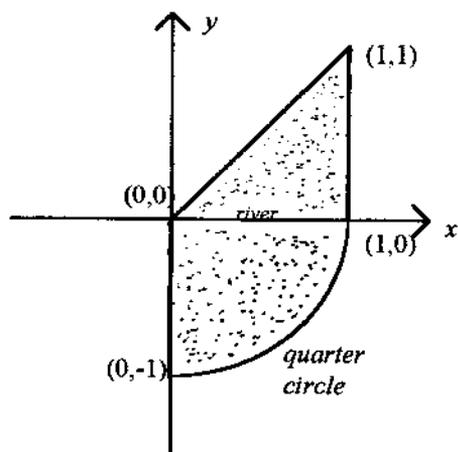
The time allotted for this exam is 90 minutes.

Calculators are permitted.

Justify your answers carefully. No partial credit can be given for unsubstantiated answers.

1) A tiny country in Europe (see map below) has population density $f(x, y) = 1200x$ (people per square mile). Here x and y are in miles.

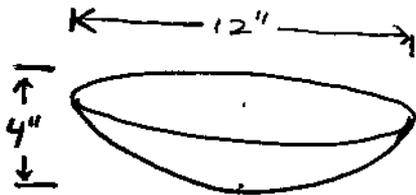
a) What is the total population of this country?



b) A river runs along the x axis, and each citizen makes a daily trip straight to the river and back. How many total miles are walked by all the citizens of the country each day?

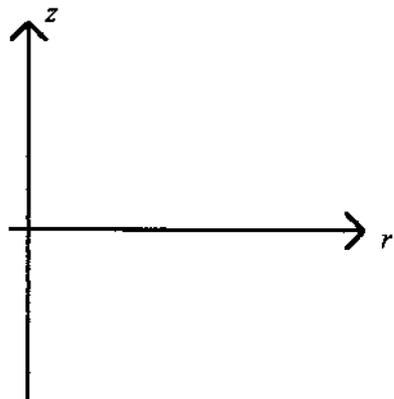
skip for spring 02 midterm 2 practice

- 2) A parabolic bowl with equation $z = c(x^2 + y^2)$ for some constant c is used as a rain gauge. The bowl is 4 inches high and 12 inches wide at the top. The bowl, initially empty, is left outside during a storm that dumps an inch of rain. What is the depth H of water in the paraboloid after the storm? (Hint: What volume of water falls through a horizontal opening of area A in this storm?)



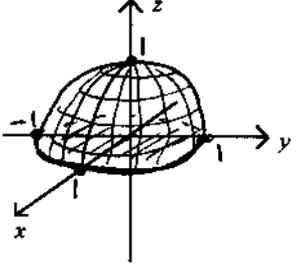
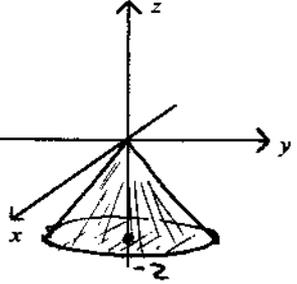
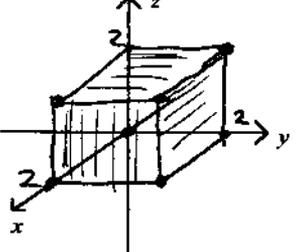
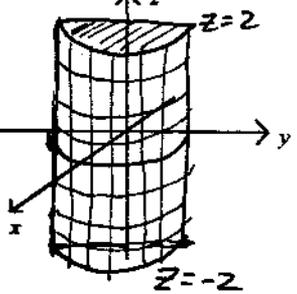
3) Let C be a circle in the yz -plane with center at $(0, 2, 0)$ and radius 1. Let S be the doughnut-shaped surface obtained by revolving the circle C around the z -axis.

a) Draw a fixed θ section of S . Number your axes.



b) Set up, but do not evaluate, an iterated integral for the volume of the doughnut of which S is the boundary.

4) In the table below, enter a +, -, or 0 for the value of $\iiint_B f dV$ for the various integrands f and solid regions B in \mathbb{R}^3 .

Integrand f Solid region B	$\cos \phi$	$\sin \theta$	$\rho \sin \phi \cos \theta$
 <p data-bbox="148 640 503 672"><i>Upper half of a ball of radius 1.</i></p>			
 <p data-bbox="173 1018 470 1081"><i>Upside-down cone with flat bottom at $z = -2$.</i></p>			
 <p data-bbox="123 1396 520 1459"><i>$2 \times 2 \times 2$ cube in 1st octant with one corner at the origin.</i></p>			
 <p data-bbox="90 1816 553 1879"><i>Front half of solid cylinder of radius 1, flat bottom at $z = -2$ and flat top at $z = 2$.</i></p>			