Math 2321 Spring 2009

Calculus III

Third Midterm Exam

Monday, April 6

Your name (please print):

Instructions: This is a closed book, closed notes exam. **Use of calculators is not permitted.** Except on multiple choice questions, you must justify all of your answers to receive credit. Notation is important, and points will be deducted for incorrect use. Please do all of your work on the paper provided.

The Honor Code requires that you neither give nor receive any aid on this exam.

Please indicate that you have read and understood these guidelines by signing your name in the space provided:

Pledged: _____

Do not write below this line[1]

Problem	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Points	5	5	5	5	10	10	10	10
Score								

Total:_____

Section 1: Multiple choice.

1. Let R be the triangular region with vertices $(0,0)$, $(2,3)$ and $(5,3)$. Express $\iint_R f(x,y)\,dA$ as an iterated integral.

a. $\displaystyle\int_0^3 \int_{2y/3}^{5y/3} f(x,y)\,dy\,dx$

b. $\displaystyle\int_0^5 \int_{3x/5}^{3x/2} f(x,y)\,dy\,dx$

c. $\displaystyle\int_0^3 \int_{2y/3}^{5y/3} f(x,y)\,dx\,dy$

d. $\displaystyle\int_0^3 \int_2^5 f(x,y)\,dx\,dy$

2. Evaluate the integral $\displaystyle\iint_R \frac{2x-y}{x-3y}\,dA$, where R is the parallelogram enclosed by the lines $2x-y=0$, $2x-y=4$, $x-3y=1$ and $x-3y=8$.

a. $120\ln 2$

b. $\dfrac{24}{5}\ln 2$

c. $-120\ln 2$

d. $-\dfrac{24}{5}\ln 2$

3. If E lies between the spheres $x^2 + y^2 + z^2 = 1$ and $x^2 + y^2 + z^2 = 4$ in the first octant, evaluate $\iiint_E (x^2 + y^2)z \, dV$.

a. $\dfrac{21\pi}{16}$

b. $\dfrac{9\pi}{8}$

c. $\dfrac{5\pi}{8}$

d. $\dfrac{7\pi}{6}$

4. Evaluate the integral $\iint_R \sin(x^2 + y^2)\, dA$, where $R = \{(x, y) \,|\, 1 \leq x^2 + y^2 \leq 3\,, x \leq 0\}$.

a. $\pi\,(3\sin(3) + \cos(3) - \sin(1) - \cos(1))$

b. $\dfrac{\pi}{2}\,(\cos(1) - \cos(3))$

c. $\pi\,(\cos(1) - \cos(3))$

d. $\dfrac{\pi}{2}\,(\cos(1) - \cos(9))$

Section 2: Free response

5. Consider the integral $\displaystyle\int_0^4 \int_{\sqrt{x}}^2 \frac{1}{y^3+1}\, dy\, dx$.

a. Sketch the region of integration.

b. Evaluate the integral.

6. The transformation $(x, y) = T(u, v) = (e^{u+v}, e^{u-v})$ carries the rectangle $S = [0, 1] \times [-1, 1]$ to the region R bounded by the curves $xy = 1$, $xy = e^2$, $y = e^2 x$ and $y = x/e^2$.

a. Find the area of R.

b. Evaluate $\displaystyle\iint_R \frac{x}{y}\, dA$.

7. Let E be the region in $\mathbb{R}^3$ bounded by $y = x^2, z = 0$ and $y + 2z = 4$. Express the integral $\iiint_E f(x, y, z)\, dV$ as an iterated integral, using the specified order of integration.

a. $dz\, dx\, dy$

b. $dy\, dz\, dx$

c. $dx\, dy\, dz$

8. Evaluate the integral $\iiint_E xz\,dV$ where E lies above the plane $z = 0$, below the plane $z = x$, and inside the cylinder $x^2 + y^2 = 4$.