MA 26100 Exam 2 April 14, 2009

Version 1

Name ________________________________

Student ID ________________________________

Recitation Instructor ________________________________

Recitation Time ________________________________

Instructions

1. This exam contains 10 problems, each worth 10 points.
2. Please supply all information requested above and on the mark–sense sheet. In the space provided for Test number, mark(Version) 01.
3. Work only in the space provided, or on the backside of the pages. Mark your answers clearly on the scantron. Also circle your choice for each problem in this booklet.
4. No books, notes or calculator, please.

Key EBEDC CBADA

1. If $f(x,y) = x^3 + 3xy - y^3 + y$, which of the following statements is true?

A. $(1,-1)$ is a saddle point

B. $f(1,-1)$ is a local minimum

C. $f(1,-1)$ is a local maximum

D. $f(1,-1)$ is an absolute maximum

E. $(1,-1)$ is not a critical point

2. Find the maximum of $f(x,y) = xy$ in the region $\frac{x^2}{4} + y^2 \leq 1$.

A. $\frac{1}{2}$

B. 1

C. $\sqrt{2}$

D. $2\sqrt{2}$

E. $\frac{1}{\sqrt{2}}$

3. Evaluate the integral

$$\int_0^{\sqrt{\pi/6}} \int_0^{x} \cos(x^2)\, dydx.$$

A. $2\sqrt{\pi}$

B. $\sqrt{\pi}$

C. $\frac{\pi}{6}$

D. $\frac{1}{6}$

E. $\frac{1}{4}$

4. A solid in the 1^{st} octant is bounded by the surfaces $x^2 + z^2 = 9$, $y = 2x$, $y = 0$, and $z = 0$. The volume of the solid is given by

A. $\int_0^3 \int_0^{y/2} \sqrt{9 - y^2}\, dydx$

B. $\int_0^6 \int_0^{2x} (x^2 + z^2)\, dydx$

C. $\int_0^6 \int_0^{x/2} \sqrt{9 - x^2}\, dydx$

D. $\int_0^3 \int_0^{2x} \sqrt{9 - x^2}\, dydx$

E. $\int_0^3 \int_0^{2x} (x^2 + z^2)\, dydx$

5. Evaluate the integral

$$\int_0^1 \int_y^{\sqrt{2-y^2}} 3(x-y)\,dxdy$$

by converting to polar coordinates.

A. $2\sqrt{2}$

B. 2

C. $4-2\sqrt{2}$

D. $6\sqrt{2}$

E. $5\sqrt{2}$

6. Interchange the order of integration and then evaluate

$$\int_0^1 \int_{x^{3/4}}^1 \frac{2x^2}{y^5+1}\, dydx.$$

A. $\ln 2$

B. $\frac{1}{2}\ln 2$

C. $\frac{2}{15}\ln 2$

D. $\ln 32$

E. $\ln 5\sqrt{2}$

7. Fill in the quantities a and b that convert the triple integral from rectangular coordinates to spherical coordinates:

$$\int_{-2}^{2}\int_{0}^{\sqrt{4-x^2}}\int_{0}^{\sqrt{x^2+y^2}} z\,dz\,dy\,dx = \int_{0}^{\pi}\int_{a}^{\pi/2}\int_{0}^{2\csc\varphi} b\,d\rho\,d\varphi\,d\theta$$

A. $a=0, b=\rho^3\sin\varphi\cos\varphi$

B. $a=\pi/4, b=\rho^3\sin\varphi\cos\varphi$

C. $a=0, b=\rho^2\cos\varphi$

D. $a=\pi/4, b=\rho^3\sin\varphi$

E. $a=0, b=\rho\cos\varphi$

8 Let $f(x,y)=x^2y$ and let C be the curve $\vec{r}(t)=e^{t^2}\vec{i}+\sin(\frac{\pi}{2}t)\vec{j}$, $0\leq t\leq 1$. Then $\int_C \nabla f\cdot d\vec{r}=$

A. e^2

B. e

C. $e-1$

D. e^2-1

E. e^2-e

9. Let C be the poygonal path from (0,0) to (2,0), from (2,0) to (2,4) and then back to (0,0) along $y = 2x$. Then $\int\limits_C (y^2 + x)dx + (3x^2 + 2xy)\,dy =$

A. -32

B. 0

C. -16

D. 32

E. 16

10. If $\vec{F}(x, y, z) = ye^{-x}\vec{i} + e^{-x}\vec{j} + (x + y + z)\vec{k}$ then $curl\vec{F}$ at $(x, y, z) = (0, 1, 2)$ is

A. $\vec{i} - \vec{j} - 2\vec{k}$

B. $e\vec{i} - e\vec{j} + \vec{k}$

C. $e^{-1}\vec{i} - e^{-1}\vec{j} + \vec{k}$

D. $\vec{i} - \vec{j} + 2e^{-1}\vec{k}$

E. $\vec{i} + \vec{j} + 2\vec{k}$