MA 261 Exam 2 November 20, 2008

Name ______________________________

Student ID ______________________________

Recitation Instructor ______________________________

Recitation Section and Time ______________________________

Instructions

1. This exam contains 10 problems each worth 10 points.
2. Please supply all information requested above on the mark–sense sheet.
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 E A C B E C A D B D

1. The points

$$A = (0,1), \quad \text{and} \quad B = \left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$$

are critical points of the function

$$f(x,y) = 2x^3 - 3x^2y - y^3 + 3y.$$

Classify each as a relative maximum, relative minimum, or saddle point.

A. A is a relative minimum, B is a relative maximum.

B. A is a saddle point, B is a relative minimum.

C. A and B are relative maxima.

D. A and B are relative minima.

E. A is a relative maximum, B is a saddle point.

2. Find the maximum value of

$$f(x, y) = x + 3y$$

subject to the constraint $x^2 + y^2 = 10$.

A. 10

B. 12

C. 14

D. 16

E. 18

3. Let E be the region bounded below by the cone $z = \sqrt{\frac{x^2+y^2}{3}}$ and above by $x^2 + y^2 + z^2 = 3$. If

$$\iiint_E z\,dV = \int_0^{2\pi} \int_0^a \int_0^b c\; d\rho d\phi d\theta,$$

then

A. $a = \frac{\pi}{3},\ b = 3,\ c = \rho^2 \sin\phi \cos\phi$

B. $a = \frac{\pi}{6},\ b = 3,\ c = \rho^2 \sin^2\phi \cos\phi$

C. $a = \frac{\pi}{3},\ b = \sqrt{3},\ c = \rho^3 \sin\phi \cos\phi$

D. $a = \frac{\pi}{6},\ b = \sqrt{3},\ c = \rho^3 \sin^2\phi$

E. $a = \frac{\pi}{3},\ b = 3,\ c = \rho^2 \sin\phi$

4. Which integral gives the volume of the solid in the first octant bounded by the surfaces $x^2 + z^2 = 4,\ y = 2x,\ y = 0,\ z = 0$?

A. $\int_0^2 \int_0^{y/2} \sqrt{4 - y^2}\ dydx$

B. $\int_0^2 \int_0^{2x} \sqrt{4 - x^2}\ dydx$

C. $\int_0^2 \int_0^{2x} \sqrt{x^2 + z^2}\ dydx$

D. $\int_0^2 \int_0^{y/2} \sqrt{4 - y^2}\ dydx$

E. $\int_0^2 \int_0^{y/2} \sqrt{x^2 + z^2}\ dydx$

5. Interchange the order of integration in

$$\int_0^1 \int_{-\sqrt{x}}^{\sqrt{x}} f(x,y)dydx$$

A. $\int_0^1 \int_y^1 f(x,y)\ dxdy$

B. $\int_{-1}^1 \int_x^{\sqrt{x}} f(x,y)\ dxdy$

C. $\int_{-1}^1 \int_{y^2}^{y} f(x,y)\ dxdy$

D. $\int_0^1 \int_0^{\sqrt{x}} f(x,y)\ dxdy$

E. $\int_{-1}^1 \int_{y^2}^1 f(x,y)\ dxdy$

6. The area of the surface of the paraboloid $z = 11 - x^2 - y^2$ above the plane $z = 2$ is given by the integral

A. $\int_0^{2\pi} \int_0^2 \sqrt{1+4r^2}\ rdrd\theta,$

B. $\int_0^{\pi} \int_0^3 \sqrt{1+4r^2}\ rdrd\theta,$

C. $\int_0^{2\pi} \int_0^3 \sqrt{1+4r^2}\ rdrd\theta,$

D. $\int_0^{2\pi} \int_0^3 rdrd\theta,$

E. $\int_0^{\pi/2} \int_0^3 \sqrt{1+4r^2}\ rdrd\theta$

7. Let C be the curve $(\sin 3t, t, \cos 3t)$, $0 \leq t \leq \pi$.

$$\int_C y^2 ds =$$

A. $\frac{\pi^3\sqrt{10}}{3}$

B. $\frac{\pi^3 10}{3}$

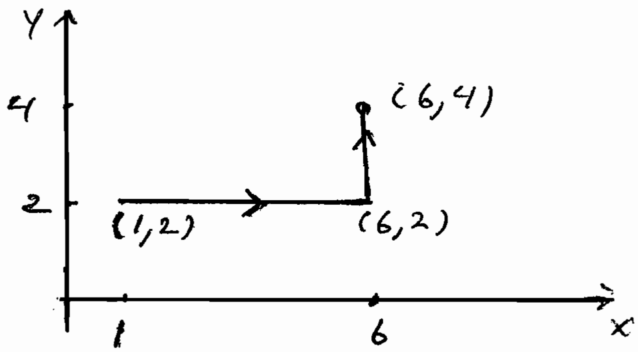
C. $\frac{\pi^2\sqrt{10}}{4}$

D. $\frac{\pi^2 10}{4}$

E. $10\pi^2$

8. Let C be the indicated curve. Then

$$\int_C ye^{xy}dx + xe^{xy}dy =$$



A. $\frac{1}{2}(e^{24}-1)$

B. $e^{24}-e$

C. $e^{24}-1$

D. $e^{24}-e^2$

E. e^{24}

9. Choose K so div $F = 0$ where

$$F = (x^2yz, xy^2z, Kxyz^2 + e^{xy}).$$

A. There is no such K

B. $K = -2$

C. $K = 0$

D. $K = 1$

E. $K = -3$

10. Evaluate $\int_C y^3 dx - x^3 dy$ where C is the circle $x^2 + y^2 = 1$ oriented counterclockwise.

A. 0

B. $-\pi$

C. π

D. $-\frac{3\pi}{2}$

E. $\frac{3\pi}{2}$