MA 261 Exam 2 November 19, 2007

Name ____________________________

Student ID ____________________________

Recitation Instructor ____________________________

Recitation Time ____________________________

Instructions

1. This exam contains 12 problems. Problems 1–4 are worth 9 points and 5–12 are worth 8 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 DBAE CDAB DCEC

1. In the Lagrange multiplier method for finding the maximum and minimum values of $3x - y + 6$ subject to the constraint $x^2 + y^2 = 10$, the values of the Lagrange multipliers λ that occur as solutions are:

A. $\lambda = \frac{1}{16}$ and $-\frac{1}{16}$

B. $\lambda = \frac{1}{4}$ and $-\frac{1}{4}$

C. $\lambda = \frac{1}{3}$ and $-\frac{1}{3}$

D. $\lambda = \frac{1}{2}$ and $-\frac{1}{2}$

E. $\lambda = 1$ and -1

2. The function $f(x,y) = x^3 - y^3 - 3xy + 6$ has local extrema consisting of:

A. One local maximum and one local minimum.

B. One local maximum and one saddle point.

C. One local minimum and one saddle point.

D. One local maximum, one local minimum, and one saddle point.

E. One local minimum and two saddle points.

3. If the order of integration is reversed $\int_0^4 \int_{\frac{y}{2}}^{\sqrt{y}} f(x,y)\ dx\, dy =$

A. $\int_0^2 \int_{x^2}^{2x} f(x,y) dy dx$

B. $\int_0^4 \int_{x^2}^{2x} f(x,y) dy dx$

C. $\int_0^4 \int_{x^2}^{\frac{x}{2}} f(x,y) dy dx$

D. $\int_0^2 \int_{x^2}^{x} f(x,y) dy dx$

E. $\int_0^4 \int_{x^2}^{x} f(x,y) dy dx$

4. Evaluate $\iint_D e^{y^2} dA$, where D is the triangular region with vertices $(0,0)$, $(0,1)$, $(2,1)$.

A. 1

B. e

C. e^2

D. $e+1$

E. $e-1$

5. Which iterated integral, in polar coordinates, gives the surface area of the part of the paraboloid $z = 16 - 3x^2 - 3y^2$ above the plane $z = 4$?

A. $\displaystyle\int_0^{2\pi}\int_0^{\frac{4}{\sqrt{3}}} \sqrt{1+36r^2}\, r\, dr\, d\theta$

B. $\displaystyle\int_0^{2\pi}\int_0^{1} \sqrt{1+36r^2}\, r\, dr\, d\theta$

C. $\displaystyle\int_0^{2\pi}\int_0^{2} \sqrt{1+36r^2}\, r\, dr\, d\theta$

D. $\displaystyle\int_0^{2\pi}\int_0^{1} \sqrt{1+36r^2}\, r^2 dr\, d\theta$

E. $\displaystyle\int_0^{2\pi}\int_0^{2\sqrt{3}} \sqrt{1+36r^2}\, dr\, d\theta$

6. The integral $\displaystyle\int_0^{\frac{3}{\sqrt{2}}}\int_0^{\sqrt{\frac{9}{2}-x^2}}\int_{\sqrt{x^2+y^2}}^{\sqrt{9-(x^2+y^2)}} 10y\, dz\, dy\, dx$ in *Spherical Coordinates* is :

A. $\displaystyle\int_0^{\pi}\int_0^{\frac{\pi}{2}}\int_0^{3} 10\rho^2 \sin^2\phi\, \sin\theta\, d\rho\, d\phi\, d\theta$

B. $\displaystyle\int_0^{\frac{\pi}{2}}\int_{\frac{\pi}{4}}^{\frac{\pi}{2}}\int_0^{3} 10\rho^3 \sin^2\phi\, \sin\theta\, d\rho\, d\phi\, d\theta$

C. $\displaystyle\int_0^{\pi}\int_{\frac{\pi}{4}}^{\frac{\pi}{2}}\int_0^{3} 10\rho^2 \sin^2\phi\, \sin\theta\, d\rho\, d\phi\, d\theta$

D. $\displaystyle\int_0^{\frac{\pi}{2}}\int_0^{\frac{\pi}{4}}\int_0^{3} 10\rho^3 \sin^2\phi\, \sin\theta\, d\rho\, d\phi\, d\theta$

E. $\displaystyle\int_{\frac{\pi}{4}}^{\frac{\pi}{2}}\int_0^{\frac{\pi}{4}}\int_0^{3} 10\rho^2 \sin^2\phi\, \sin\theta\, d\rho\, d\phi\, d\theta$

7. Find the mass of a wire described by the curve $y = x^2 + 1$, where $0 \le x \le 1$, with density $\rho(x, y) = 12x$.

A. $5^{\frac{3}{2}} - 1$

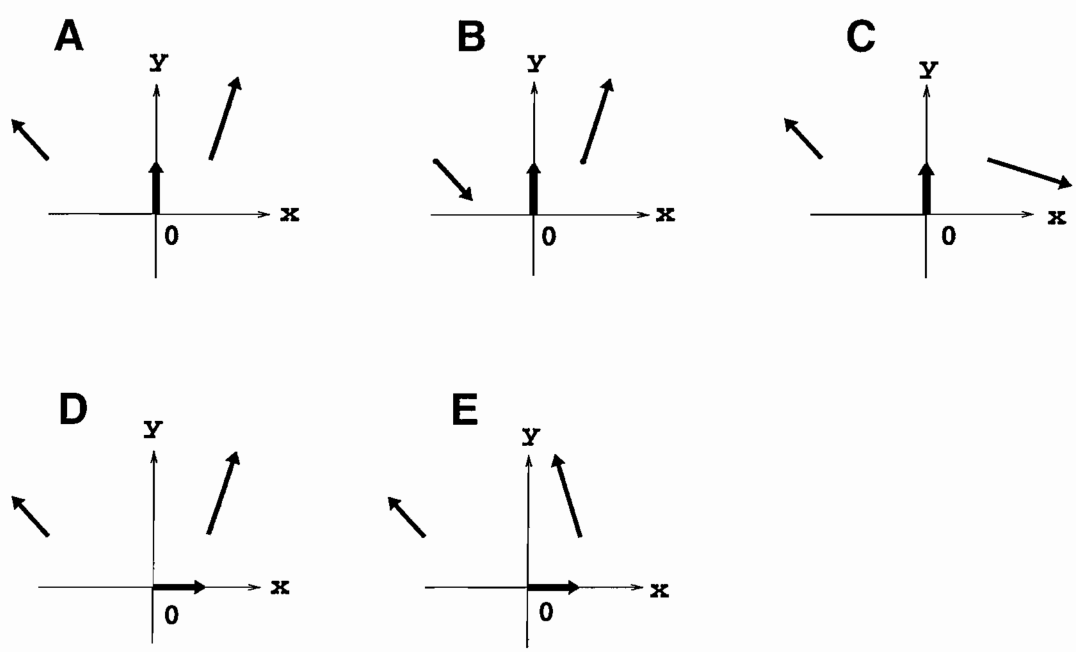
B. $\frac{1}{12}\left(5^{\frac{3}{2}} - 1\right)$

C. $\frac{1}{2}\left(5^{\frac{3}{2}} - 1\right)$

D. $\frac{2}{3}\left(5^{\frac{3}{2}} - 1\right)$

E. 6

8. The vector field $\mathbf{F}(x, y) = \langle y,\ x + 1\rangle$ at the points $(0,0)$, $(1,1)$, and $(-2,1)$ looks most like:



9. Let C be the line segment from $(0,1)$ to $(1,3)$. If $\mathbf{F}(x,y) = \langle y, 0\rangle$, compute $\int_C \mathbf{F} \cdot d\mathbf{r}$.

A. $\frac{3}{4}$

B. $\frac{3}{2}$

C. 1

D. 2

E. $\frac{5}{2}$

10. Set up a triple integral for the volume of the solid in the first octant that is below the surface $z = x^2 + y^2$ and bounded on its sides by $x = 2$ and $y - x = 4$.

A. $\int_0^2 \int_0^{4+y} \int_0^{x^2+y^2} dz\, dx\, dy$

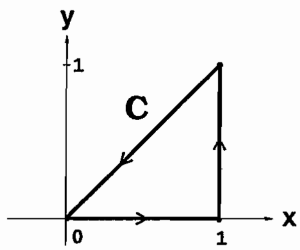
B. $\int_0^4 \int_0^{2-y} \int_0^{x^2+y^2} dz\, dx\, dy$

C. $\int_0^2 \int_0^{4+x} \int_0^{x^2+y^2} dz\, dy\, dx$

D. $\int_0^4 \int_0^{4-y} \int_0^{x^2+y^2} dz\, dx\, dy$

E. $\int_0^4 \int_0^{4+x} \int_0^{x^2+y^2} dz\, dy\, dx$

11. Let C denote the closed triangular path from $(0,0)$ to $(1,0)$ to $(1,1)$ to $(0,0)$. Evaluate $\int_C (y^2 + x)dx + (y-2)dy$.



A. 0

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

C. $-\frac{1}{4}$

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

E. $-\frac{1}{3}$

12. If $\mathbf{G}(x,y,z) = (2x+1)\,\mathbf{i} + (yz)\,\mathbf{j} + x\,\mathbf{k}$, compute curl $\mathbf{G}(1,2,3)$.

A. $\mathbf{i} - 2\mathbf{j}$

B. $2\mathbf{i} + \mathbf{j}$

C. $-2\mathbf{i} - \mathbf{j}$

D. $2\mathbf{i} - \mathbf{j} + \mathbf{k}$

E. $-2\mathbf{i} + \mathbf{j} + \mathbf{k}$