King Fahd University of Petroleum and Minerals
Department of Mathematics

Semester I (021) Jan 23/2003

Math 201 - Final Exam Time 2 hrs & 30 Minutes

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Name ______________________ I D # ___________ Serial # ________ **A**

1. The exam is composed of 18 multiple choice questions and 4 **solving questions**

   Answer all the questions

   For each question mark your choice(one only) on the assigned space given below

Notation 1.

Question #	*a*	*b*	*c*	*d*	*e*
1	*a*	*b*	*c*	*d*	*e*
2	*a*	*b*	*c*	*d*	*e*
3	*a*	*b*	*c*	*d*	*e*
4	*a*	*b*	*c*	*d*	*e*
5	*a*	*b*	*c*	*d*	*e*
6	*a*	*b*	*c*	*d*	*e*
7	*a*	*b*	*c*	*d*	*e*
8	*a*	*b*	*c*	*d*	*e*
9	*a*	*b*	*c*	*d*	*e*
10	*a*	*b*	*c*	*d*	*e*
11	*a*	*b*	*c*	*d*	*e*
12	*a*	*b*	*c*	*d*	*e*
13	*a*	*b*	*c*	*d*	*e*
14	*a*	*b*	*c*	*d*	*e*
15	*a*	*b*	*c*	*d*	*e*
16	*a*	*b*	*c*	*d*	*e*
17	*a*	*b*	*c*	*d*	*e*
18	*a*	*b*	*c*	*d*	*e*

Question #	19	20	21	22	*Total*
Grade	/ 4	/ 4	/ 4	/ 4	

2. *One of the following is* <u>*FALSE*</u>

a. *The graph of the equation* $2x^2 \quad 2x \quad 2y^2 \quad 6y \quad 2z^2 \qquad 12$ *is a sphere*.

b. *The graph of the equation* $x \qquad z^2 \quad y^2$ *is a hyperbolic paraboloid*.

c. *The graph of the equation* $x^2 \quad 9y^2 \quad 2z^2 \quad 1 \qquad 0$ *is a hyperboloid of two sheets*

d. *The graph of the equation* $4x^2 \quad 3z^2 \qquad 12$ *is a cylinder*

e. *The graph of the equation* $x^2 \quad 4y^2 \quad 3z^2 \qquad 0$ *is a cone*

3. *Let* $W \quad f\,x{,}y \quad , x \quad e^r \cos \quad$, *and* $y \quad e^r \sin \quad$, *then* $y\frac{W}{r} \quad x\frac{W}{}$ *is equal to*:

a. $x^2 \quad y^2\ W_y$

b. 0

c. $2y^2 W_y$

d. $W_y \quad W_x$

e. $2x^2 W_x$

4. *The equation of the tangent plane to the surface* $z \quad x^2 \quad 3y^2$ *that is parallel to the plane* $2x \quad 6y \quad z \quad 4 \quad 0$ *is*:

a. $2x \quad 6y \quad z \quad 4 \quad 0$

b. $2x \quad 6y \quad z \quad 4 \quad 0$

c. $2x \quad 6y \quad z \quad 0$

d. $2x \quad 6y \quad z \quad 1 \quad 0$

e. $2x \quad 6y \quad z \quad 3 \quad 0$

5. *The value of t at which the parametric curve* $x \quad 7t^3 \quad 15t^2 \quad 24t \quad 7$, $y \quad 3t^2 \quad 6t \quad 1$ *has horizontal tangent is*:

a. 2

b. 3

c. 1

d. 0

e. 4

6. *The distance from* $P\ 2,1,0$ *to the plane* $2x \quad 2y \quad z \quad 3 \quad 0$ *is*:

a. 5

b. 2

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

d. 3

e. $\frac{5}{3}$

7. *The number of points of intersection between the two polar curves* $r \quad 2\sin 3 \quad , r \quad 1$

a. 12

b. 6

c. 4

d. 8

e. 3

7. *The triple integral* $\overset{1}{\underset{0}{}}\ \overset{\sqrt{1\ \ x^2}}{\underset{0}{}}\ \overset{\sqrt{4\ \ x^2\ \ y^2}}{\underset{\sqrt{1\ \ x^2\ \ y^2}}{}}\ \sqrt{x^2\quad y^2\quad z^2}\ dz\, dy\, dx$ *is equivalent to the cylindrical triple integral*:

- **a.** $\overset{\overline{\ }}{\underset{0}{2}}\ \overset{1}{\underset{0}{}}\ \overset{4\ r^2}{\underset{1\ r^2}{}}\ \sqrt{z^2\quad r^2}\ r\, dz\, dr\, d$
- **b.** $\overset{\overline{\ }}{\underset{0}{2}}\ \overset{2}{\underset{0}{}}\ \overset{\sqrt{4\ r^2}}{\underset{\sqrt{1\ r^2}}{}}\ \sqrt{z^2\quad r^2}\ dz\, dr\, d$
- **c.** $\overset{2}{\underset{0}{}}\ \overset{1}{\underset{0}{}}\ \overset{\sqrt{4\ r^2}}{\underset{\sqrt{1\ r^2}}{}}\ \sqrt{z^2\quad r^2}\ r\, dz\, dr\, d$
- **d.** $\overset{\overline{\ }}{\underset{0}{2}}\ \overset{1}{\underset{0}{}}\ \overset{\sqrt{4\ r^2}}{\underset{\sqrt{1\ r^2}}{}}\ \sqrt{z^2\quad r^2}\ r\, dz\, dr\, d$
- **e.** $\overset{\overline{\ }}{\underset{0}{2}}\ \overset{1}{\underset{0}{}}\ \overset{\sqrt{4\ r^2}}{\underset{r}{}}\ \sqrt{z^2\quad r^2}\ r\, dz\, dr\, d$

8. *Let* $f\ x,y\quad y\ln\ x\quad y$ *, then the maximum directional derivative of* $f\ x,y$ *at* $P\quad 3,4$ *is* :

- **a.** 4
- **b.** $\dfrac{4}{\sqrt{2}}$
- **c.** 5
- **d.** $4\sqrt{2}$
- **e.** $5\sqrt{2}$

9. *The point of intersection of the plane* $2x \quad y \quad 2z \quad 1 \quad 0$ *and the line* $x \quad t \quad 1$, $y \quad 2t \quad 3$, $z \quad t \quad 2$ *is* :

a. $4, \ 3, \ 5$

b. $1, 3, \ 2$

c. $0, 5, \ 1$

d. $1, \ 1, 1$

e. $0, \ 1, 0$

10. *The area of the polar region inside the smaller loop of* $r \quad 1 \quad 2\cos$ *is* :

a. $\frac{\sqrt{3}}{2}$

b. $\frac{3\sqrt{3}}{2}$

c. $\sqrt{3}$

d. $\frac{\sqrt{3}}{3}$

e.

11. *The volume of the solid Q which is between the surfaces* $z \quad 4 \quad x^2 \quad y^2$ *, and* $z \quad 3x^2 \quad 3y^2$ *is given by the triple integral*

a. $\int_{1}^{1}\int_{0}^{\sqrt{1\ x^2}}\int_{3x^2\ 3y^2}^{4\ x^2\ y^2} dz\,dy\,dx$

b. $\int_{1}^{1}\int_{\sqrt{1\ x^2}}^{\sqrt{1\ x^2}}\int_{4\ x^2\ y^2}^{3x^2\ 3y^2} dz\,dy\,dx$

c. $\int_{1}^{1}\int_{\sqrt{1\ x^2}}^{\sqrt{1\ x^2}}\int_{3x^2\ 3y^2}^{4\ x^2\ y^2} dz\,dy\,dx$

d. $\int_{0}^{1}\int_{\sqrt{1\ x^2}}^{\sqrt{3\ x^2}}\int_{4\ x^2\ y^2}^{3x^2\ 3y^2} dz\,dy\,dx$

e. $\int_{0}^{1}\int_{0}^{\sqrt{1\ x^2}}\int_{0}^{3x^2\ 3y^2} dz\,dy\,dx$

12. *The limit* $\lim_{x,y,z \quad 0,0,0} \dfrac{xy \quad yz \quad xz}{x^2 \quad y^2 \quad z^2}$

a. *Equals to* 1

b. *Equals to* 3

c. *Equals to* $\frac{1}{3}$

d. *does not exist*

e. *Equals to* 0

13. *One of the following is FALSE*

a. *The point* $P\ 3,0,3$ *has equivalent spherical coordinates* $3\sqrt{2},0,\frac{}{4}$.

b. *The equation of the surface in cylindrical coordinates* $z \quad r$ *is equivalent to the equation in rectangular coordinates* $z \quad \sqrt{x^2 \quad y^2}$

c. *The equation of the level surface* $f\ x,y,z \quad k$, *where* $f\ x,y,z \quad 2x^2 \quad y^2 \quad 3z^2$, *and* $k \quad 1$ *is hyperboloid of two sheets*

d. *For the vectors* $\boldsymbol{v} \quad 2,\ 1,1$, *and* $\boldsymbol{u} \quad 1,\ 2,0$, *then* $\boldsymbol{v} \quad \boldsymbol{u} \quad 0$

e. $\ _0^3\ _0^2 y\, dy\, dx \quad 3$

14. *The area of the triangle with vertices* $P\ 2,1,0$, $Q\ 1,2,\ 1$, $R\ 1,\ 1,2$ *is*:

a. 3

b. $3\sqrt{2}$

c. $\frac{9}{2}$

d. $\frac{9}{\sqrt{2}}$

e. $\frac{3\sqrt{2}}{2}$

15. *Let R be the region bounded by the curves* $x \quad y^2$ *and* $x \quad y \quad 2 \quad 0$, *then the area of the region R is given by the double integral* :

a. $\int_{1}^{2}\int_{y\ 2}^{y^2} dx\, dy$

b. $\int_{0}^{4}\int_{x\ 2}^{\sqrt{x}} dy\, dx$

c. $\int_{0}^{4}\int_{\sqrt{x}}^{\sqrt{x}} dy\, dx$

d. $\int_{1}^{2}\int_{y^2}^{y\ 2} dx\, dy$

e. $\int_{0}^{2}\int_{0}^{y^2} dx\, dy$

16. *By using total differential to approximate the change in* $W \quad \dfrac{1}{x \quad 2y \quad z}$ *as* x, y, z *changes from* $P \quad 1, \ 2, 4$ *to* $1.04, \ 1.98, 3.97$, *is*

a. 0.04

b. 0.02

c. 0.05

d. 0.03

e. 0.05

17. *Let* $\boldsymbol{u}$ *and* $\boldsymbol{v}$ *be vectors in* 3-*dimensional space*, *then* $\boldsymbol{u} \quad \boldsymbol{v}^{2} \quad \boldsymbol{u} \quad \boldsymbol{v}^{2}$ *equals to* :

a. $2\ \boldsymbol{u}^{2}\ \boldsymbol{v}^{2}$

b. $\boldsymbol{u}^{2}\ \boldsymbol{v}^{2}$

c. $\boldsymbol{u}^{2} \quad \boldsymbol{v}^{2}$

d. $\boldsymbol{u}^{2} \quad \boldsymbol{v}^{2}$

e. $4\ \boldsymbol{u}^{2}\ \boldsymbol{v}^{2}$

18. *Let* $f\ x,y \quad 4xy \quad x^2 \quad y^2$, *then the graph of* $f\ x,y$ *has*:

a. *Saddle point at* $0,0$

b. *Relative maximum at* $1, \quad 1$

c. *Relative minimum at* $0,0$

d. *Saddle point at* $1,1$

e. *Relative maximum at* $1,1$

<u>Solving Part</u> ***Show all of your work***

19. *By using polar coordinates , evaluate the integral* $_R \; x^2 \quad y^2 \;\; dA$ *, where R is the region in the first quadrant inside the circle* $x^2 \quad y^2 \quad 4$

20. *Find equation of the line of intersection of the planes* $2x \quad y \quad z \quad 3 \quad 0$ *and* $x \quad 2y \quad 3z \quad 1 \quad 0.$

21. *Find the maximum and the minimum of the function* $f\ x,y\quad x^2\quad y^2\quad 4x\quad 2y$ *, over the closed region inside the rectangle with vertices* $0,0$, $0,\ 2$, $3,0$, $3,\ 2$

22. *Use Lagrange multiplier to find the point on the circle* $x\quad 3\ ^2\quad y\quad 1\ ^2\quad 4$ *that is closest to the origin*.