## King Fahd University of Petroleum & Minerals Department of Mathematics and Statistics

Math 201 Final Exam Term 102 Thursday, June 9, 2011

# EXAM COVER

Number of versions: 4 Number of questions: 20 Number of Answers: 5 per question

### King Fahd University of Petroleum & Minerals Department of Mathematics and Statistics

Math 201
Final Exam
Term 102
Thursday, June 9, 2011
Net Time Allowed: 180 minutes

## **MASTER VERSION**

- 1. If  $x = t + \sin t$  and  $y = t \cos t$ , then  $\left. \frac{d^2y}{dx^2} \right|_{t=0}$  is equal to
  - (a)  $\frac{1}{4}$
  - (b)  $\frac{1}{5}$
  - (c)  $\frac{1}{2}$
  - (d) 1
  - (e) 0

2. The area of the region enclosed by one loop of the curve

$$r = 7\cos 4\theta$$

- (a)  $\frac{49\pi}{16}$
- (b)  $16\pi$
- (c)  $\pi$
- (d)  $\frac{49\pi}{11}$
- (e)  $\frac{\pi}{11}$

3. An equation of the tangent line to the curve

$$r = 2 + \sin \theta$$
 at  $\theta = \frac{\pi}{6}$ 

is

- (a)  $2y + (6\sqrt{3})x = 25$
- (b)  $(3\sqrt{3})y + x = 25$
- (c) x + y = 25
- (d)  $25x y = 3\sqrt{3}$
- (e)  $(6\sqrt{3})x y = 25$

4. Let  $\mathcal{C}$  be the circle of intersection of the sphere

$$x^2 + y^2 + z^2 + mx + 2y + 2z + 5 = 0$$

with the xy-plane. If the radius of  $\mathcal{C}$  is 2, then which of the points (x, y) below can be the center of  $\mathcal{C}$ ?

- (a)  $(-2\sqrt{2}, -1)$
- (b)  $(-\sqrt{2}, -1)$
- (c)  $(2\sqrt{2}, 1)$
- (d)  $(-2\sqrt{2},1)$
- (e)  $(\sqrt{2}, 1)$

The equation 5.

$$25x^2 + y^2 - z^2 - 6y + 6z = 0$$

represents

- (a) a cone
- (b) a hyperboloid of one sheet
- (c) an ellipsoid
- (d) a hyperbolic paraboloid
- an elliptic paraboloid

- The distance from the plane x 2y + 2z = 1 to the plane 6. -2x + 4y - 4z = 3 is equal to
  - (a)  $\frac{5}{6}$
  - (b) 0

  - (c)  $\frac{5}{3}$  (d)  $\frac{1}{3}$  (e)  $\frac{7}{6}$

- 7. If  $u = \tan^{-1}(x+2y), x = e^{2s-t}, y = 1+2st$  then the value of  $\frac{\partial u}{\partial t}$  when s = 1, t = 2 is
  - (a)  $\frac{3}{122}$
  - (b)  $\frac{2}{122}$
  - (c)  $\frac{5}{122}$
  - (d)  $\frac{1}{4}$
  - (e)  $\frac{1}{122}$

- 8. If the maximum rate of change of  $f(x, y, z) = \frac{y+z}{x}$  at the point  $P(\sqrt{a}, 1, -1)$  is equal to 2, then the value of a is
  - (a)  $\frac{1}{2}$
  - (b) 1
  - (c)  $\frac{1}{3}$
  - (d) 0
  - (e)  $\frac{1}{4}$

9. The function  $f(x,y) = x^3 - 3xy + y^3$  has

- (a) A saddle point at (0,0) and a local minimum at (1,1)
- (b) Two saddle points at (0,0) and (1,1)
- (c) A saddle point at (0,0) and a local maximum at (1,1)
- (d) A local maximum at (0,0) and a local minimum at (1,1)
- (e) A local maximum at (0,0) and a saddle point at (1,1)

10. The absolute maximum value of  $f(x,y) = x^2 - 2y^2 + 4y - 1$  on the region  $R = \{(x,y)|\ x^2 + 2y^2 \le 4\}$  is

- (a) 4
- (b) 5
- (c)  $\frac{15}{4}$
- (d) 1
- (e)  $\frac{3}{5}$

11. An equation of the tangent plane to the surface

$$z = 4x^3y^2 + 2y$$
 at the point  $(1, -2, 12)$ 

is

- (a) 48x 14y z 64 = 0
- (b) 24x 14y z 40 = 0
- (c) 48x 7y z 50 = 0
- (d) 24x 7y z 26 = 0
- (e) 48x + 7y z 22 = 0

- 12. If  $f(x,y) = \frac{y^2 e^{3\sin y}}{\cos y} + x^2 y e^y$ , then at the point  $(x,y) = (3,1), f_{yxx}$  is equal to
  - (a) 4e
  - (b) 2e
  - (c) e
  - (d) 3e
  - (e) 0

- A function f satisfies  $f_x = x^2 + Axy + 3y^2$  and  $f_y = x^2 + Bxy + y^2$ 13. for some constants A and B. Then A + B is equal to
  - (a) 8
  - (b) 6
  - (c) 4
  - (d) 2
  - (e) 0

- Let E be the solid bounded by the planes x = 0, y = 0, z = 014. and x+2y+2z=2. Then the value of  $\iiint y^2 dV$  is equal to
  - (a)  $\frac{1}{30}$

  - (b)  $\frac{1}{35}$ (c)  $\frac{1}{20}$ (d)  $\frac{1}{25}$

  - (e)  $\frac{1}{10}$

15. The value of the triple integral

$$\int_0^2 \int_0^{\sqrt{4-x^2}} \int_{x^2+y^2}^4 x \ dz \ dy \ dx$$

is equal to

- (a)  $\frac{64}{15}$
- (b)  $\frac{2\pi}{3}$
- (c)  $\frac{5\pi}{3}$
- (d)  $\frac{3\pi}{2}$
- (e)  $\frac{3}{4}$

16. The value of the iterated integral

$$\int_0^1 \int_x^1 x \sqrt{y^2 - x^2} \, dy \, dx$$

- (a)  $\frac{1}{12}$
- (b)  $\frac{2}{9}$
- (c) 0
- (d)  $4\sqrt{2}$
- (e)  $\frac{\sqrt{2}}{2}$

- 17. The volume, in the first octant, of the solid inside both the hemisphere  $z=\sqrt{16-x^2-y^2}$  and the cylinder  $x^2+y^2-4x=0$  is
  - (a)  $\frac{32}{9}(3\pi 4)$
  - (b)  $\frac{64\pi}{3}$
  - (c)  $\frac{\pi}{9} + 4$
  - (d)  $\frac{3\pi}{4} + \frac{64}{9}$
  - (e)  $\frac{64\pi}{9}$

- 18. If D is the region bounded by the semicircle  $x = \sqrt{4 y^2}$  and the y-axis, then  $\iint_D e^{-x^2 y^2} dA$  is equal to
  - (a)  $\frac{(1-e^{-4})\pi}{2}$
  - (b)  $(1+e^{-4})\pi$
  - (c)  $\frac{\pi}{e^4}$
  - (d)  $2\pi e^{-4}$
  - (e)  $\pi \frac{e^{-4}}{2}$

- The volume of the solid region inside the sphere  $x^2 + y^2 + z^2 = 4$ 19. and between the cones  $\phi = \frac{\pi}{3}$  and  $\phi = \frac{2\pi}{3}$  is equal to
  - (a)  $\frac{16\pi}{3}$
  - (b)  $\frac{2\pi}{3}$
  - (c)  $\frac{8\pi}{3}$ (d)  $\frac{4\pi}{3}$ (e)  $\frac{\pi}{3}$

- If the point (4, -4, 2) is given in rectangular coordinates, 20. then the cylindrical coordinates are given by
  - (a)  $\left(4\sqrt{2}, \frac{7\pi}{4}, 2\right)$
  - (b)  $\left(4\sqrt{2}, \frac{\pi}{4}, 2\right)$
  - (c)  $\left(4, \frac{7\sqrt{\pi}}{4}, 2\right)$
  - (d)  $(4\sqrt{2},0,2)$
  - (e)  $\left(4\sqrt{2}, \frac{3\pi}{4}, 2\right)$

#### King Fahd University of Petroleum & Minerals Department of Mathematics and Statistics

#### CODE 001

## Math 201 Final Exam Term 102

#### CODE 001

Thursday, June 9, 2011 Net Time Allowed: 180 minutes

Name:	9	
ID:		c:

Check that this exam has 20 questions.

#### **Important Instructions:**

- 1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
- 2. Use HB 2.5 pencils only.
- 3. Use a good eraser. DO NOT use the erasers attached to the pencil.
- 4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
- 5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
- 6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
- 7. When bubbling, make sure that the bubbled space is fully covered.
- 8. When erasing a bubble, make sure that you do not leave any trace of penciling.

- 1. The absolute maximum value of  $f(x,y) = x^2 2y^2 + 4y 1$  on the region  $R = \{(x,y) | x^2 + 2y^2 \le 4\}$  is
  - (a)  $\frac{15}{4}$
  - (b) 4
  - (c)  $\frac{3}{5}$
  - (d) 1
  - (e) 5

2. Let  $\mathcal{C}$  be the circle of intersection of the sphere

$$x^2 + y^2 + z^2 + mx + 2y + 2z + 5 = 0$$

with the xy-plane. If the radius of  $\mathcal{C}$  is 2, then which of the points (x, y) below can be the center of  $\mathcal{C}$ ?

- (a)  $(-2\sqrt{2}, -1)$
- (b)  $(\sqrt{2}, 1)$
- (c)  $(2\sqrt{2}, 1)$
- (d)  $(-2\sqrt{2},1)$
- (e)  $(-\sqrt{2}, -1)$

- 3. The volume, in the first octant, of the solid inside both the hemisphere  $z=\sqrt{16-x^2-y^2}$  and the cylinder  $x^2+y^2-4x=0$  is
  - (a)  $\frac{64\pi}{9}$
  - (b)  $\frac{\pi}{9} + 4$
  - (c)  $\frac{32}{9}(3\pi 4)$
  - (d)  $\frac{3\pi}{4} + \frac{64}{9}$
  - (e)  $\frac{64\pi}{3}$

- 4. If D is the region bounded by the semicircle  $x = \sqrt{4 y^2}$  and the y-axis, then  $\iint_D e^{-x^2 y^2} dA$  is equal to
  - (a)  $(1+e^{-4})\pi$
  - (b)  $\frac{\pi}{e^4}$
  - (c)  $\frac{(1-e^{-4})\pi}{2}$
  - (d)  $2\pi e^{-4}$
  - (e)  $\pi \frac{e^{-4}}{2}$

5. The equation

$$25x^2 + y^2 - z^2 - 6y + 6z = 0$$

represents

- (a) a hyperbolic paraboloid
- (b) an ellipsoid
- (c) a hyperboloid of one sheet
- (d) a cone
- (e) an elliptic paraboloid

- 6. If  $u = \tan^{-1}(x+2y)$ ,  $x = e^{2s-t}$ , y = 1+2st then the value of  $\frac{\partial u}{\partial t}$  when s = 1, t = 2 is
  - (a)  $\frac{1}{122}$
  - (b)  $\frac{2}{122}$
  - (c)  $\frac{3}{122}$
  - (d)  $\frac{1}{4}$
  - (e)  $\frac{5}{122}$

The value of the triple integral 7.

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

- (a)  $\frac{2\pi}{3}$
- (b)  $\frac{3\pi}{2}$ (c)  $\frac{3}{4}$ (d)  $\frac{5\pi}{3}$

- (e)  $\frac{64}{15}$

- If  $f(x,y) = \frac{y^2 e^{3\sin y}}{\cos y} + x^2 y e^y$ , then at the point  $(x,y) = (3,1), f_{yxx}$  is equal to
  - (a) 4e
  - (b) 2e
  - $(c) \quad 0$
  - (d) e
  - (e) 3e

- 9. If the maximum rate of change of  $f(x, y, z) = \frac{y+z}{x}$  at the point  $P(\sqrt{a}, 1, -1)$  is equal to 2, then the value of a is
  - $(a) \quad 0$
  - (b)  $\frac{1}{4}$
  - (c) 1
  - (d)  $\frac{1}{3}$
  - (e)  $\frac{1}{2}$

- 10. Let E be the solid bounded by the planes  $x=0,\ y=0,\ z=0$  and x+2y+2z=2. Then the value of  $\iiint_E y^2\ dV$  is equal to
  - (a)  $\frac{1}{20}$
  - (b)  $\frac{1}{30}$
  - (c)  $\frac{1}{10}$
  - (d)  $\frac{1}{25}$
  - (e)  $\frac{1}{35}$

11. The value of the iterated integral

$$\int_{0}^{1} \int_{x}^{1} x \sqrt{y^{2} - x^{2}} \, dy \, dx$$

- (a)  $\frac{2}{9}$
- (b)  $\frac{\sqrt{2}}{2}$
- (c)  $4\sqrt{2}$
- (d) 0
- (e)  $\frac{1}{12}$

- 12. The function  $f(x,y) = x^3 3xy + y^3$  has
  - (a) A local maximum at (0,0) and a saddle point at (1,1)
  - (b) Two saddle points at (0,0) and (1,1)
  - (c) A saddle point at (0,0) and a local minimum at (1,1)
  - (d) A saddle point at (0,0) and a local maximum at (1,1)
  - (e) A local maximum at (0,0) and a local minimum at (1,1)

- 13. A function f satisfies  $f_x = x^2 + Axy + 3y^2$  and  $f_y = x^2 + Bxy + y^2$  for some constants A and B. Then A + B is equal to
  - (a) 2
  - (b) 4
  - (c) 8
  - (d) 0
  - (e) 6

14. An equation of the tangent plane to the surface

$$z = 4x^3y^2 + 2y$$
 at the point  $(1, -2, 12)$ 

is

- (a) 48x 7y z 50 = 0
- (b) 48x + 7y z 22 = 0
- (c) 24x 7y z 26 = 0
- (d) 24x 14y z 40 = 0
- (e) 48x 14y z 64 = 0

- The distance from the plane x 2y + 2z = 1 to the plane 15. -2x + 4y - 4z = 3 is equal to
  - (a)  $\frac{5}{3}$
  - (b)  $\frac{7}{6}$
  - (c)  $\frac{1}{3}$  (d)  $\frac{5}{6}$

  - (e) 0

- The volume of the solid region inside the sphere  $x^2+y^2+z^2=4$  and between the cones  $\phi=\frac{\pi}{3}$  and  $\phi=\frac{2\pi}{3}$  is equal to 16.
  - (a)  $\frac{2\pi}{3}$
  - (b)  $\frac{4\pi}{3}$ (c)  $\frac{\pi}{3}$

  - (d)  $\frac{8\pi}{3}$
  - (e)  $\frac{16\pi}{3}$

17. An equation of the tangent line to the curve

$$r = 2 + \sin \theta$$
 at  $\theta = \frac{\pi}{6}$ 

is

- (a)  $(3\sqrt{3})y + x = 25$
- (b) x + y = 25
- (c)  $(6\sqrt{3})x y = 25$
- (d)  $2y + (6\sqrt{3})x = 25$
- (e)  $25x y = 3\sqrt{3}$

- 18. If  $x = t + \sin t$  and  $y = t \cos t$ , then  $\frac{d^2y}{dx^2}\Big|_{t=0}$  is equal to
  - (a)  $\frac{1}{2}$
  - (b)  $\frac{1}{5}$
  - (c) 0
  - (d)  $\frac{1}{4}$
  - (e) 1

- 19. If the point (4, -4, 2) is given in rectangular coordinates, then the cylindrical coordinates are given by
  - (a)  $\left(4\sqrt{2}, \frac{\pi}{4}, 2\right)$
  - (b)  $\left(4\sqrt{2}, \frac{7\pi}{4}, 2\right)$
  - (c)  $\left(4, \frac{7\sqrt{\pi}}{4}, 2\right)$
  - (d)  $\left(4\sqrt{2}, \frac{3\pi}{4}, 2\right)$
  - (e)  $(4\sqrt{2}, 0, 2)$

20. The area of the region enclosed by one loop of the curve

$$r = 7\cos 4\theta$$

- (a)  $\frac{\pi}{11}$
- (b)  $\frac{49\pi}{16}$
- (c)  $\frac{49\pi}{11}$
- (d)  $16\pi$
- (e)  $\pi$

Name		
ID	 Sec	

1	a	b	С	d	е	f
2	a	b	c	d	е	f
3	a	b	c	d	е	f
4	a	b	$\mathbf{c}$	d	е	f
5	a	b	c	d	е	f
6	a	b	$\mathbf{c}$	d	е	f
7	a	b	c	d	е	f
8	a	b	$\mathbf{c}$	d	е	f
9	a	b	c	d	е	f
10	a	b	$\mathbf{c}$	d	е	f
11	a	b	$\mathbf{c}$	d	е	f
12	a	b	c	d	е	f
13	a	b	$^{\mathrm{c}}$	d	е	f
14	a	b	c	d	е	f
15	a	b	c	d	е	f
16	a	b	С	d	е	f
17	a	b	С	d	е	f
18	a	b	С	d	е	f
19 20	a	b	c	d	е	f
	a	b	С	d	е	f
21	a	b	c	d	е	f
22	a	b	С	d	е	f
23	a	b	c	d	е	f
24	a	b	С	d	е	f
25	a	b	c	d	е	f
26	a	b	c	d	е	f
27	a	b	С	d	е	f
28	a	b	c	d	е	f
29	a	b	c	d	е	f
30	a	b	c	d	е	f
31	a	b	c	d	е	f
32	a	b	С	d	е	f
33	a	b	c	d	е	f
34	a	b	c	d	е	f
35	a	b	c	d	е	f

36	a	b	$^{\mathrm{c}}$	d	е	f
37	a	b	c	d	е	f
38	a	b	С	d	е	f
39	a	b	С	d	е	f
40	a	b	С	d	е	f
41	a	b	c	d	е	f
42	a	b	С	d	е	f
43	a	b	С	d	е	f
44	a	b	С	d	е	f
45	a	b	С	d	е	f
46	a	b	c	d	е	f
47	a	b	c	d	е	f
48	a	b	c	d	е	f
49	a	b	c	d	е	f
50	a	b	c	d	е	f
51	a	b	С	d	е	f
52	a	b	c	d	е	f
53	a	b	c	d	е	f
54	a	b	c	d	е	f
55	a	b	С	d	е	f
56	a	b	С	d	е	f
57	a	b	c	d	е	f
58	a	b	c	d	е	f
59	a	b	С	d	е	f
60	a	b	c	d	е	f
61	a	b	С	d	е	f
62	a	b	c	d	е	f
63	a	b	С	d	е	f
64	a	b	c	d	е	f
65	a	b	С	d	е	f
66	a	b	С	d	е	f
67	a	b	c	d	е	f
68	a	b	c	d	е	f
69	a	b	c	d	е	f
70	a	b	С	d	е	f

#### King Fahd University of Petroleum & Minerals Department of Mathematics and Statistics

CODE 002

## Math 201 Final Exam Term 102

#### CODE 002

Thursday, June 9, 2011 Net Time Allowed: 180 minutes

Name:		
ID:	Sec:	

Check that this exam has 20 questions.

#### **Important Instructions:**

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- 6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
- 7. When bubbling, make sure that the bubbled space is fully covered.
- 8. When erasing a bubble, make sure that you do not leave any trace of penciling.

- 1. If the point (4, -4, 2) is given in rectangular coordinates, then the cylindrical coordinates are given by
  - (a)  $\left(4, \frac{7\sqrt{\pi}}{4}, 2\right)$
  - (b)  $\left(4\sqrt{2}, \frac{3\pi}{4}, 2\right)$
  - (c)  $\left(4\sqrt{2}, \frac{7\pi}{4}, 2\right)$
  - (d)  $(4\sqrt{2}, 0, 2)$
  - (e)  $\left(4\sqrt{2}, \frac{\pi}{4}, 2\right)$

2. Let  $\mathcal{C}$  be the circle of intersection of the sphere

$$x^2 + y^2 + z^2 + mx + 2y + 2z + 5 = 0$$

with the xy-plane. If the radius of  $\mathcal{C}$  is 2, then which of the points (x, y) below can be the center of  $\mathcal{C}$ ?

- (a)  $(\sqrt{2}, 1)$
- (b)  $(-2\sqrt{2},1)$
- (c)  $(-2\sqrt{2}, -1)$
- (d)  $(2\sqrt{2}, 1)$
- (e)  $(-\sqrt{2}, -1)$

- 3. The volume, in the first octant, of the solid inside both the hemisphere  $z=\sqrt{16-x^2-y^2}$  and the cylinder  $x^2+y^2-4x=0$  is
  - (a)  $\frac{64\pi}{9}$
  - (b)  $\frac{32}{9}(3\pi 4)$
  - (c)  $\frac{3\pi}{4} + \frac{64}{9}$
  - (d)  $\frac{\pi}{9} + 4$
  - (e)  $\frac{64\pi}{3}$

- 4. A function f satisfies  $f_x = x^2 + Axy + 3y^2$  and  $f_y = x^2 + Bxy + y^2$  for some constants A and B. Then A + B is equal to
  - (a) 0
  - (b) 2
  - (c) 6
  - (d) 4
  - (e) 8

5. The value of the iterated integral

$$\int_{0}^{1} \int_{x}^{1} x \sqrt{y^{2} - x^{2}} \, dy \, dx$$

- (a)  $\frac{1}{12}$
- (b) 0
- (c)  $4\sqrt{2}$
- (d)  $\frac{2}{9}$
- (e)  $\frac{\sqrt{2}}{2}$

- 6. The absolute maximum value of  $f(x,y) = x^2 2y^2 + 4y 1$  on the region  $R = \{(x,y)|\ x^2 + 2y^2 \le 4\}$  is
  - (a)  $\frac{15}{4}$
  - (b) 5
  - (c) 4
  - (d) 1
  - (e)  $\frac{3}{5}$

If  $x = t + \sin t$  and  $y = t - \cos t$ , then  $\left. \frac{d^2y}{dx^2} \right|_{t=0}$  is equal to 7.

- (a) 1
- (b)  $\frac{1}{5}$
- (c)  $\frac{1}{2}$
- $(d) \quad 0$
- (e)  $\frac{1}{4}$

If D is the region bounded by the semicircle  $x=\sqrt{4-y^2}$  an the y-axis, then  $\iint\limits_D e^{-x^2-y^2} \,dA$  is equal to 8.

- (a)  $\pi \frac{e^{-4}}{2}$
- (b)  $\frac{(1-e^{-4})\pi}{2}$
- (c)  $2\pi e^{-4}$
- (d)  $(1 + e^{-4})\pi$ (e)  $\frac{\pi}{e^4}$

- The distance from the plane x 2y + 2z = 1 to the plane 9. -2x + 4y - 4z = 3 is equal to
  - (a)  $\frac{1}{3}$
  - (b) 0

  - (c)  $\frac{5}{6}$  (d)  $\frac{7}{6}$  (e)  $\frac{5}{3}$

10. The value of the triple integral

$$\int_0^2 \int_0^{\sqrt{4-x^2}} \int_{x^2+y^2}^4 x \ dz \ dy \ dx$$

- (a)  $\frac{3\pi}{2}$
- (b)  $\frac{64}{15}$
- (c)  $\frac{5\pi}{3}$
- $\text{(d)} \quad \frac{3}{4} \\
   \text{(e)} \quad \frac{2\pi}{3}$

- The volume of the solid region inside the sphere  $x^2 + y^2 + z^2 = 4$ 11. and between the cones  $\phi = \frac{\pi}{3}$  and  $\phi = \frac{2\pi}{3}$  is equal to
  - (a)  $\frac{\pi}{3}$
  - (b)  $\frac{4\pi}{3}$
  - (c)  $\frac{16\pi}{3}$

  - (d)  $\frac{8\pi}{3}$ (e)  $\frac{2\pi}{3}$

- The function  $f(x,y) = x^3 3xy + y^3$  has 12.
  - A local maximum at (0,0) and a saddle point at (1,1)(a)
  - A saddle point at (0,0) and a local maximum at (1,1)(b)
  - A saddle point at (0,0) and a local minimum at (1,1)(c)
  - (d) A local maximum at (0,0) and a local minimum at (1,1)
  - Two saddle points at (0,0) and (1,1)(e)

- 13. If  $u = \tan^{-1}(x+2y), x = e^{2s-t}, y = 1+2st$  then the value of  $\frac{\partial u}{\partial t}$  when s = 1, t = 2 is
  - (a)  $\frac{1}{122}$
  - (b)  $\frac{3}{122}$
  - (c)  $\frac{5}{122}$
  - (d)  $\frac{1}{4}$
  - (e)  $\frac{2}{122}$

14. An equation of the tangent plane to the surface

$$z = 4x^3y^2 + 2y$$
 at the point  $(1, -2, 12)$ 

is

(a) 
$$48x - 7y - z - 50 = 0$$

(b) 
$$48x + 7y - z - 22 = 0$$

(c) 
$$24x - 14y - z - 40 = 0$$

(d) 
$$24x - 7y - z - 26 = 0$$

(e) 
$$48x - 14y - z - 64 = 0$$

15. If  $f(x,y) = \frac{y^2 e^{3\sin y}}{\cos y} + x^2 y e^y$ , then at the point  $(x,y) = (3,1), f_{yxx}$  is equal to

- (a) 3e
- (b) *e*
- (c) 4e
- (d) 0
- (e) 2e

16. Let E be the solid bounded by the planes  $x=0,\ y=0,\ z=0$  and x+2y+2z=2. Then the value of  $\iiint_E y^2\ dV$  is equal to

- (a)  $\frac{1}{20}$
- (b)  $\frac{1}{10}$
- (c)  $\frac{1}{30}$
- (d)  $\frac{1}{25}$
- (e)  $\frac{1}{35}$

17. The equation

$$25x^2 + y^2 - z^2 - 6y + 6z = 0$$

represents

- (a) a cone
- (b) a hyperboloid of one sheet
- (c) an elliptic paraboloid
- (d) an ellipsoid
- (e) a hyperbolic paraboloid

18. The area of the region enclosed by one loop of the curve

$$r = 7\cos 4\theta$$

- (a)  $\pi$
- (b)  $16\pi$
- (c)  $\frac{49\pi}{16}$
- (d)  $\frac{\pi}{11}$
- (e)  $\frac{49\pi}{11}$

19. An equation of the tangent line to the curve

$$r = 2 + \sin \theta$$
 at  $\theta = \frac{\pi}{6}$ 

is

- (a) x + y = 25
- (b)  $2y + (6\sqrt{3})x = 25$
- (c)  $25x y = 3\sqrt{3}$
- (d)  $(3\sqrt{3})y + x = 25$
- (e)  $(6\sqrt{3})x y = 25$

20. If the maximum rate of change of  $f(x, y, z) = \frac{y+z}{x}$  at the point  $P(\sqrt{a}, 1, -1)$  is equal to 2, then the value of a is

- (a)  $\frac{1}{3}$
- (b)  $\frac{1}{2}$
- (c)  $\frac{1}{4}$
- (d) 0
- (e) 1

Name		
ID	 Sec	

1	a	b	c	d	е	f
2	a	b	c	d	е	f
3	a	b	$\mathbf{c}$	d	e	f
4	a	b	$\mathbf{c}$	d	e	f
5	a	b	c	d	е	f
6	a	b	c	d	е	f
7	a	b	$\mathbf{c}$	d	e	f
8	a	b	c	d	е	f
9	a	b	$\mathbf{c}$	d	e	f
10	a	b	c	d	е	f
11	a	b	c	d	е	f
12	a	b	c	d	е	f
13	a	b	$^{\mathrm{c}}$	d	е	f
14	a	b	c	d	е	f
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16	a	b	С	d	е	f
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18	a	b	С	d	е	f
19	a	b	$^{\mathrm{c}}$	d	е	f
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21	a	b	С	d	е	f
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23	a	b	С	d	е	f
24	a	b	c	d	е	f
25	a	b	c	d	е	f
26	a	b	$\mathbf{c}$	d	e	f
27	a	b	c	d	e	f
28	a	b	c	d	е	f
29	a	b	c	d	е	f
30	a	b	c	d	е	f
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35	a	b	c	d	e	f

36	a	b	c	d	е	f
37	a	b	С	d	е	f
38	a	b	c	d	е	f
39	a	b	c	d	е	f
40	a	b	С	d	е	f
41	a	b	С	d	е	f
42	a	b	С	d	е	f
43	a	b	c	d	е	f
44	a	b	С	d	е	f
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54	a	b	С	d	е	f
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59	a	b	С	d	е	f
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62	a	b	С	d	е	f
63	a	b	С	d	е	f
64	a	b	С	d	е	f
65	a	b	С	d	е	f
66	a	b	С	d	е	f
67	a	b	c	d	е	f
68	a	b	С	d	е	f
69 70	a	b	c	d	е	f
70	a	b	С	d	е	f

# King Fahd University of Petroleum & Minerals Department of Mathematics and Statistics

## CODE 003

# Math 201 Final Exam Term 102

## CODE 003

Thursday, June 9, 2011 Net Time Allowed: 180 minutes

Name:		
ID:	Sec:	

Check that this exam has 20 questions.

#### **Important Instructions:**

- 1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
- 2. Use HB 2.5 pencils only.
- 3. Use a good eraser. DO NOT use the erasers attached to the pencil.
- 4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
- 5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
- 6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
- 7. When bubbling, make sure that the bubbled space is fully covered.
- 8. When erasing a bubble, make sure that you do not leave any trace of penciling.

The value of the triple integral 1.

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

- (a)  $\frac{5\pi}{3}$
- (b)  $\frac{3\pi}{2}$
- (c)  $\frac{64}{15}$
- $\begin{array}{c}
  10 \\
  \frac{3}{4} \\
  \text{(e)} \quad \frac{2\pi}{3}
  \end{array}$

- If the maximum rate of change of  $f(x, y, z) = \frac{y+z}{x}$  at the 2. point  $P(\sqrt{a}, 1, -1)$  is equal to 2, then the value of a is
  - (a)  $\frac{1}{4}$
  - (b) 1
  - (c)  $\frac{1}{2}$
  - (d) 0
  - (e)  $\frac{1}{3}$

3. An equation of the tangent line to the curve

$$r = 2 + \sin \theta$$
 at  $\theta = \frac{\pi}{6}$ 

- (a)  $(3\sqrt{3})y + x = 25$
- (b)  $(6\sqrt{3})x y = 25$
- (c)  $25x y = 3\sqrt{3}$
- (d) x + y = 25
- (e)  $2y + (6\sqrt{3})x = 25$

- 4. Let E be the solid bounded by the planes  $x=0,\ y=0,\ z=0$  and x+2y+2z=2. Then the value of  $\iiint_E y^2\ dV$  is equal to
  - (a)  $\frac{1}{30}$
  - (b)  $\frac{1}{35}$
  - (c)  $\frac{1}{10}$
  - (d)  $\frac{1}{25}$
  - (e)  $\frac{1}{20}$

- 5. If the point (4, -4, 2) is given in rectangular coordinates, then the cylindrical coordinates are given by
  - (a)  $\left(4, \frac{7\sqrt{\pi}}{4}, 2\right)$
  - (b)  $\left(4\sqrt{2}, \frac{\pi}{4}, 2\right)$
  - (c)  $\left(4\sqrt{2}, \frac{3\pi}{4}, 2\right)$
  - (d)  $(4\sqrt{2}, 0, 2)$
  - (e)  $\left(4\sqrt{2}, \frac{7\pi}{4}, 2\right)$

- 6. A function f satisfies  $f_x = x^2 + Axy + 3y^2$  and  $f_y = x^2 + Bxy + y^2$  for some constants A and B. Then A + B is equal to
  - (a) 8
  - (b) 6
  - (c) 4
  - (d) 2
  - (e) 0

7. An equation of the tangent plane to the surface

$$z = 4x^3y^2 + 2y$$
 at the point  $(1, -2, 12)$ 

- (a) 48x + 7y z 22 = 0
- (b) 48x 7y z 50 = 0
- (c) 24x 7y z 26 = 0
- (d) 48x 14y z 64 = 0
- (e) 24x 14y z 40 = 0

- 8. If  $f(x,y) = \frac{y^2 e^{3\sin y}}{\cos y} + x^2 y e^y$ , then at the point  $(x,y) = (3,1), f_{yxx}$  is equal to
  - (a) 3e
  - $(b) \quad 0$
  - (c) e
  - (d) 4e
  - (e) 2e

- 9. The function  $f(x,y) = x^3 3xy + y^3$  has
  - (a) A local maximum at (0,0) and a local minimum at (1,1)
  - (b) Two saddle points at (0,0) and (1,1)
  - (c) A saddle point at (0,0) and a local minimum at (1,1)
  - (d) A saddle point at (0,0) and a local maximum at (1,1)
  - (e) A local maximum at (0,0) and a saddle point at (1,1)

10. The value of the iterated integral

$$\int_{0}^{1} \int_{x}^{1} x \sqrt{y^{2} - x^{2}} \, dy \, dx$$

- (a) 0
- (b)  $\frac{2}{9}$
- (c)  $4\sqrt{2}$
- (d)  $\frac{1}{12}$
- (e)  $\frac{\sqrt{2}}{2}$

- The volume of the solid region inside the sphere  $x^2 + y^2 + z^2 = 4$ 11. and between the cones  $\phi = \frac{\pi}{3}$  and  $\phi = \frac{2\pi}{3}$  is equal to
  - (a)  $\frac{16\pi}{3}$
  - (b)  $\frac{2\pi}{3}$
  - (c)  $\frac{4\pi}{3}$ (d)  $\frac{\pi}{3}$ (e)  $\frac{8\pi}{3}$

12. The equation

$$25x^2 + y^2 - z^2 - 6y + 6z = 0$$

represents

- (a) a cone
- (b) an ellipsoid
- a hyperboloid of one sheet
- (d) an elliptic paraboloid
- a hyperbolic paraboloid

- 13. If  $u = \tan^{-1}(x+2y), x = e^{2s-t}, y = 1+2st$  then the value of  $\frac{\partial u}{\partial t}$  when s = 1, t = 2 is
  - (a)  $\frac{3}{122}$
  - (b)  $\frac{1}{122}$
  - (c)  $\frac{1}{4}$
  - (d)  $\frac{2}{122}$
  - (e)  $\frac{5}{122}$

14. The area of the region enclosed by one loop of the curve

$$r = 7\cos 4\theta$$

- (a)  $\frac{\pi}{11}$
- (b)  $\frac{49\pi}{16}$
- (c)  $16\pi$
- (d)  $\pi$
- (e)  $\frac{49\pi}{11}$

- 15. The absolute maximum value of  $f(x,y) = x^2 2y^2 + 4y 1$  on the region  $R = \{(x,y)|\ x^2 + 2y^2 \le 4\}$  is
  - (a) 1
  - (b)  $\frac{15}{4}$
  - (c) 4
  - (d) 5
  - (e)  $\frac{3}{5}$

- 16. The volume, in the first octant, of the solid inside both the hemisphere  $z=\sqrt{16-x^2-y^2}$  and the cylinder  $x^2+y^2-4x=0$  is
  - (a)  $\frac{64\pi}{9}$
  - (b)  $\frac{3\pi}{4} + \frac{64}{9}$
  - (c)  $\frac{32}{9}(3\pi 4)$
  - (d)  $\frac{\pi}{9} + 4$
  - (e)  $\frac{64\pi}{3}$

Let  $\mathcal{C}$  be the circle of intersection of the sphere 17.

$$x^2 + y^2 + z^2 + mx + 2y + 2z + 5 = 0$$

with the xy-plane. If the radius of C is 2, then which of the points (x, y) below can be the center of C?

- (a)  $(2\sqrt{2}, 1)$
- (b)  $(-\sqrt{2}, -1)$
- (c)  $(-2\sqrt{2},1)$
- (d)  $(\sqrt{2}, 1)$
- (e)  $(-2\sqrt{2}, -1)$

- The distance from the plane x 2y + 2z = 1 to the plane 18. -2x + 4y - 4z = 3 is equal to
  - (a) 0
  - (b)  $\frac{1}{3}$

  - (c)  $\frac{5}{6}$  (d)  $\frac{5}{3}$  (e)  $\frac{7}{6}$

- 19. If  $x = t + \sin t$  and  $y = t \cos t$ , then  $\frac{d^2y}{dx^2}\Big|_{t=0}$  is equal to
  - (a) 1
  - (b) 0
  - (c)  $\frac{1}{2}$
  - (d)  $\frac{1}{4}$
  - (e)  $\frac{1}{5}$

- 20. If D is the region bounded by the semicircle  $x = \sqrt{4 y^2}$  and the y-axis, then  $\iint_D e^{-x^2 y^2} dA$  is equal to
  - (a)  $2\pi e^{-4}$
  - (b)  $\frac{(1-e^{-4})\pi}{2}$
  - (c)  $(1+e^{-4})\pi$
  - (d)  $\frac{\pi}{e^4}$
  - (e)  $\pi \frac{e^{-4}}{2}$

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1         a         b         c         d         e         f           2         a         b         c         d         e         f           3         a         b         c         d         e         f           4         a         b         c         d         e         f           5         a         b         c         d         e         f           6         a         b         c         d         e         f           7         a         b         c         d         e         f           8         a         b         c         d         e         f           9         a         b         c         d         e         f           10         a         b         c         d         e         f           11         a         b         c         d         e         f           12         a         b         c         d         e         f           13         a         b         c         d         e         f           15         a         b <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>							
3         a         b         c         d         e         f           4         a         b         c         d         e         f           5         a         b         c         d         e         f           6         a         b         c         d         e         f           7         a         b         c         d         e         f           8         a         b         c         d         e         f           9         a         b         c         d         e         f           10         a         b         c         d         e         f           11         a         b         c         d         e         f           12         a         b         c         d         e         f           13         a         b         c         d         e         f           14         a         b         c         d         e         f           15         a         b         c         d         e         f           15         a         b<		a	b	c	d	е	
4         a         b         c         d         e         f           5         a         b         c         d         e         f           6         a         b         c         d         e         f           7         a         b         c         d         e         f           8         a         b         c         d         e         f           9         a         b         c         d         e         f           10         a         b         c         d         e         f           11         a         b         c         d         e         f           12         a         b         c         d         e         f           13         a         b         c         d         e         f           14         a         b         c         d         e         f           15         a         b         c         d         e         f           15         a         b         c         d         e         f           16         a         b		a	b	c		е	
5         a         b         c         d         e         f           6         a         b         c         d         e         f           7         a         b         c         d         e         f           8         a         b         c         d         e         f           9         a         b         c         d         e         f           10         a         b         c         d         e         f           11         a         b         c         d         e         f           12         a         b         c         d         e         f           12         a         b         c         d         e         f           13         a         b         c         d         e         f           14         a         b         c         d         e         f           15         a         b         c         d         e         f           15         a         b         c         d         e         f           16         a		a		$\mathbf{c}$		е	
6 a b c d e f 7 a b c d e f 8 a b c d e f 9 a b c d e f 10 a b c d e f 11 a b c d e f 11 a b c d e f 12 a b c d e f 13 a b c d e f 14 a b c d e f 15 a b c d e f 16 a b c d e f 17 a b c d e f 18 a b c d e f 19 a b c d e f 19 a b c d e f 20 a b c d e f 21 a b c d e f 22 a b c d e f 23 a b c d e f 24 a b c d e f 25 a b c d e f 26 a b c d e f 27 a b c d e f 28 a b c d e f 29 a b c d e f 30 a b c d e f 31 a b c d e f 31 a b c d e f 32 a b c d e f 33 a b c d e f 34 a b c d e f		a		$\mathbf{c}$		е	
7         a         b         c         d         e         f           8         a         b         c         d         e         f           9         a         b         c         d         e         f           10         a         b         c         d         e         f           11         a         b         c         d         e         f           12         a         b         c         d         e         f           13         a         b         c         d         e         f           14         a         b         c         d         e         f           14         a         b         c         d         e         f           15         a         b         c         d         e         f           16         a         b         c         d         e         f           17         a         b         c         d         e         f           18         a         b         c         d         e         f           20         a <t< td=""><td></td><td>a</td><td></td><td>c</td><td></td><td>е</td><td></td></t<>		a		c		е	
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11         a         b         c         d         e         f           12         a         b         c         d         e         f           13         a         b         c         d         e         f           14         a         b         c         d         e         f           15         a         b         c         d         e         f           16         a         b         c         d         e         f           17         a         b         c         d         e         f           18         a         b         c         d         e         f           18         a         b         c         d         e         f           19         a         b         c         d         e         f           20         a         b         c         d         e         f           21         a         b         c         d         e         f           22         a         b         c         d         e         f           23         a		a				e	
12       a       b       c       d       e       f         13       a       b       c       d       e       f         14       a       b       c       d       e       f         15       a       b       c       d       e       f         16       a       b       c       d       e       f         17       a       b       c       d       e       f         18       a       b       c       d       e       f         19       a       b       c       d       e       f         20       a       b       c       d       e       f         21       a       b       c       d       e       f         21       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c		a		c		е	
13       a       b       c       d       e       f         14       a       b       c       d       e       f         15       a       b       c       d       e       f         16       a       b       c       d       e       f         17       a       b       c       d       e       f         18       a       b       c       d       e       f         19       a       b       c       d       e       f         20       a       b       c       d       e       f         21       a       b       c       d       e       f         21       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c       d       e       f         28       a       b       c		a		c		e	
14         a         b         c         d         e         f           15         a         b         c         d         e         f           16         a         b         c         d         e         f           17         a         b         c         d         e         f           18         a         b         c         d         e         f           19         a         b         c         d         e         f           20         a         b         c         d         e         f           21         a         b         c         d         e         f           21         a         b         c         d         e         f           22         a         b         c         d         e         f           23         a         b         c         d         e         f           24         a         b         c         d         e         f           25         a         b         c         d         e         f           27         a		a				е	
15         a         b         c         d         e         f           16         a         b         c         d         e         f           17         a         b         c         d         e         f           18         a         b         c         d         e         f           19         a         b         c         d         e         f           20         a         b         c         d         e         f           21         a         b         c         d         e         f           22         a         b         c         d         e         f           23         a         b         c         d         e         f           24         a         b         c         d         e         f           25         a         b         c         d         e         f           25         a         b         c         d         e         f           26         a         b         c         d         e         f           28         a		a		$\mathbf{c}$		е	
16       a       b       c       d       e       f         17       a       b       c       d       e       f         18       a       b       c       d       e       f         19       a       b       c       d       e       f         20       a       b       c       d       e       f         21       a       b       c       d       e       f         22       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c       d       e       f         27       a       b       c       d       e       f         28       a       b       c       d       e       f         30       a       b       c       d       e       f         31       a       b       c	14	a		c		е	f
17       a       b       c       d       e       f         18       a       b       c       d       e       f         19       a       b       c       d       e       f         20       a       b       c       d       e       f         21       a       b       c       d       e       f         22       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c       d       e       f         27       a       b       c       d       e       f         28       a       b       c       d       e       f         30       a       b       c       d       e       f         31       a       b       c       d       e       f         32       a       b       c		a	b	С		е	f
18       a       b       c       d       e       f         19       a       b       c       d       e       f         20       a       b       c       d       e       f         21       a       b       c       d       e       f         22       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c       d       e       f         27       a       b       c       d       e       f         28       a       b       c       d       e       f         30       a       b       c       d       e       f         31       a       b       c       d       e       f         32       a       b       c       d       e       f         33       a       b       c		a	b	С		е	f
19       a       b       c       d       e       f         20       a       b       c       d       e       f         21       a       b       c       d       e       f         22       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c       d       e       f         27       a       b       c       d       e       f         28       a       b       c       d       e       f         30       a       b       c       d       e       f         31       a       b       c       d       e       f         32       a       b       c       d       e       f         33       a       b       c       d       e       f         34       a       b       c		a		С	d	е	
20       a       b       c       d       e       f         21       a       b       c       d       e       f         22       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c       d       e       f         27       a       b       c       d       e       f         28       a       b       c       d       e       f         29       a       b       c       d       e       f         30       a       b       c       d       e       f         31       a       b       c       d       e       f         32       a       b       c       d       e       f         33       a       b       c       d       e       f         34       a       b       c		a	b	С		е	f
21       a       b       c       d       e       f         22       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c       d       e       f         27       a       b       c       d       e       f         28       a       b       c       d       e       f         29       a       b       c       d       e       f         30       a       b       c       d       e       f         31       a       b       c       d       e       f         32       a       b       c       d       e       f         33       a       b       c       d       e       f		a		С		е	
22       a       b       c       d       e       f         23       a       b       c       d       e       f         24       a       b       c       d       e       f         25       a       b       c       d       e       f         26       a       b       c       d       e       f         27       a       b       c       d       e       f         28       a       b       c       d       e       f         29       a       b       c       d       e       f         30       a       b       c       d       e       f         31       a       b       c       d       e       f         32       a       b       c       d       e       f         33       a       b       c       d       e       f         34       a       b       c       d       e       f		a		c		е	
23     a     b     c     d     e     f       24     a     b     c     d     e     f       25     a     b     c     d     e     f       26     a     b     c     d     e     f       27     a     b     c     d     e     f       28     a     b     c     d     e     f       29     a     b     c     d     e     f       30     a     b     c     d     e     f       31     a     b     c     d     e     f       32     a     b     c     d     e     f       33     a     b     c     d     e     f       34     a     b     c     d     e     f		a	b	c		е	
24     a     b     c     d     e     f       25     a     b     c     d     e     f       26     a     b     c     d     e     f       27     a     b     c     d     e     f       28     a     b     c     d     e     f       29     a     b     c     d     e     f       30     a     b     c     d     e     f       31     a     b     c     d     e     f       32     a     b     c     d     e     f       33     a     b     c     d     e     f       34     a     b     c     d     e     f		a	b	С		е	
25     a     b     c     d     e     f       26     a     b     c     d     e     f       27     a     b     c     d     e     f       28     a     b     c     d     e     f       29     a     b     c     d     e     f       30     a     b     c     d     e     f       31     a     b     c     d     e     f       32     a     b     c     d     e     f       33     a     b     c     d     e     f       34     a     b     c     d     e     f		a	b	c		е	
26     a     b     c     d     e     f       27     a     b     c     d     e     f       28     a     b     c     d     e     f       29     a     b     c     d     e     f       30     a     b     c     d     e     f       31     a     b     c     d     e     f       32     a     b     c     d     e     f       33     a     b     c     d     e     f       34     a     b     c     d     e     f		a	b	С		е	
27     a     b     c     d     e     f       28     a     b     c     d     e     f       29     a     b     c     d     e     f       30     a     b     c     d     e     f       31     a     b     c     d     e     f       32     a     b     c     d     e     f       33     a     b     c     d     e     f       34     a     b     c     d     e     f	25	a	b	c	d	е	
28     a     b     c     d     e     f       29     a     b     c     d     e     f       30     a     b     c     d     e     f       31     a     b     c     d     e     f       32     a     b     c     d     e     f       33     a     b     c     d     e     f       34     a     b     c     d     e     f		a	b	c		е	
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30     a     b     c     d     e     f       31     a     b     c     d     e     f       32     a     b     c     d     e     f       33     a     b     c     d     e     f       34     a     b     c     d     e     f	28	a	b	С		е	
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	35	a	b	c	d	е	f

36	a	b	c	d	е	f
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57	a	b	С	d	е	f
58	a	b	С	d	е	f
59	a	b	c	d	е	f
60	a	b	$^{\mathrm{c}}$	d	е	f
61	a	b	c	d	е	f
62	a	b	С	d	е	f
63	a	b	c	d	е	f
64	a	b	$^{\mathrm{c}}$	d	е	f
65	a	b	c	d	е	f
66	a	b	$^{\mathrm{c}}$	d	е	f
67	a	b	c	d	е	f
68	a	b	$\mathbf{c}$	d	e	f
69	a	b	c	d	е	f
70	a.	h	С	d	e	f

# King Fahd University of Petroleum & Minerals Department of Mathematics and Statistics

CODE 004

# Math 201 Final Exam Term 102

## CODE 004

Thursday, June 9, 2011 Net Time Allowed: 180 minutes

Name:		
ID:	Sec:	

Check that this exam has 20 questions.

#### **Important Instructions:**

- 1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
- 2. Use HB 2.5 pencils only.
- 3. Use a good eraser. DO NOT use the erasers attached to the pencil.
- 4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
- 5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
- 6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
- 7. When bubbling, make sure that the bubbled space is fully covered.
- 8. When erasing a bubble, make sure that you do not leave any trace of penciling.

The equation 1.

$$25x^2 + y^2 - z^2 - 6y + 6z = 0$$

represents

- an elliptic paraboloid
- an ellipsoid (b)
- (c) a cone
- (d) a hyperbolic paraboloid
- a hyperboloid of one sheet

- The volume of the solid region inside the sphere  $x^2 + y^2 + z^2 = 4$ 2. and between the cones  $\phi = \frac{\pi}{3}$  and  $\phi = \frac{2\pi}{3}$  is equal to
  - (a)  $\frac{4\pi}{3}$
  - (b)  $\frac{2\pi}{3}$ (c)  $\frac{\pi}{3}$

  - (d)  $\frac{8\pi}{3}$
  - (e)  $\frac{16\pi}{3}$

- 3. Let E be the solid bounded by the planes  $x=0,\ y=0,\ z=0$  and x+2y+2z=2. Then the value of  $\iiint_E y^2\ dV$  is equal to
  - (a)  $\frac{1}{25}$
  - (b)  $\frac{1}{20}$
  - (c)  $\frac{1}{35}$
  - (d)  $\frac{1}{10}$
  - (e)  $\frac{1}{30}$

4. Let C be the circle of intersection of the sphere

$$x^2 + y^2 + z^2 + mx + 2y + 2z + 5 = 0$$

with the xy-plane. If the radius of  $\mathcal{C}$  is 2, then which of the points (x, y) below can be the center of  $\mathcal{C}$ ?

- (a)  $(-\sqrt{2}, -1)$
- (b)  $(\sqrt{2}, 1)$
- (c)  $(-2\sqrt{2}, -1)$
- (d)  $(2\sqrt{2}, 1)$
- (e)  $(-2\sqrt{2}, 1)$

The value of the triple integral 5.

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

- (a)  $\frac{64}{15}$
- (b)  $\frac{3}{4}$  (c)  $\frac{3\pi}{2}$
- (d)  $\frac{5\pi}{3}$
- (e)  $\frac{2\pi}{3}$

- The distance from the plane x 2y + 2z = 1 to the plane 6. -2x + 4y - 4z = 3 is equal to
  - $(a) \quad 0$

  - (b)  $\frac{7}{6}$ (c)  $\frac{5}{3}$ (d)  $\frac{1}{3}$ (e)  $\frac{5}{6}$

7. If  $x = t + \sin t$  and  $y = t - \cos t$ , then  $\left. \frac{d^2y}{dx^2} \right|_{t=0}$  is equal to

- (a)  $\frac{1}{5}$
- (b) 1
- (c)  $\frac{1}{4}$
- (d) 0
- (e)  $\frac{1}{2}$

8. The value of the iterated integral

$$\int_{0}^{1} \int_{r}^{1} x \sqrt{y^{2} - x^{2}} \, dy \, dx$$

- (a)  $\frac{2}{9}$
- (b)  $\frac{1}{12}$
- (c)  $\frac{\sqrt{2}}{2}$
- (d)  $4\sqrt{2}$
- (e) 0

- 9. The volume, in the first octant, of the solid inside both the hemisphere  $z=\sqrt{16-x^2-y^2}$  and the cylinder  $x^2+y^2-4x=0$  is
  - (a)  $\frac{3\pi}{4} + \frac{64}{9}$
  - (b)  $\frac{\pi}{9} + 4$
  - (c)  $\frac{64\pi}{9}$
  - (d)  $\frac{64\pi}{3}$
  - (e)  $\frac{32}{9}(3\pi 4)$

- 10. If  $f(x,y) = \frac{y^2 e^{3\sin y}}{\cos y} + x^2 y e^y$ , then at the point  $(x,y) = (3,1), f_{yxx}$  is equal to
  - (a) 4e
  - (b) 2e
  - (c) 3e
  - (d) *e*
  - $(e) \quad 0$

- 11. The absolute maximum value of  $f(x,y) = x^2 2y^2 + 4y 1$  on the region  $R = \{(x,y)|\ x^2 + 2y^2 \le 4\}$  is
  - (a)  $\frac{3}{5}$
  - (b) 4
  - (c)  $\frac{15}{4}$
  - (d) 5
  - (e) 1

- 12. The function  $f(x,y) = x^3 3xy + y^3$  has
  - (a) A saddle point at (0,0) and a local maximum at (1,1)
  - (b) A local maximum at (0,0) and a saddle point at (1,1)
  - (c) A saddle point at (0,0) and a local minimum at (1,1)
  - (d) Two saddle points at (0,0) and (1,1)
  - (e) A local maximum at (0,0) and a local minimum at (1,1)

- 13. If  $u = \tan^{-1}(x+2y), x = e^{2s-t}, y = 1+2st$  then the value of  $\frac{\partial u}{\partial t}$  when s = 1, t = 2 is
  - (a)  $\frac{2}{122}$
  - (b)  $\frac{3}{122}$
  - (c)  $\frac{5}{122}$
  - (d)  $\frac{1}{122}$
  - (e)  $\frac{1}{4}$

14. The area of the region enclosed by one loop of the curve

$$r = 7\cos 4\theta$$

- (a)  $\frac{\pi}{11}$
- (b)  $\pi$
- (c)  $\frac{49\pi}{11}$
- (d)  $16\pi$
- (e)  $\frac{49\pi}{16}$

- 15. If D is the region bounded by the semicircle  $x = \sqrt{4 y^2}$  and the y-axis, then  $\iint_D e^{-x^2 y^2} dA$  is equal to
  - (a)  $2\pi e^{-4}$
  - (b)  $\pi \frac{e^{-4}}{2}$
  - (c)  $\frac{\pi}{e^4}$
  - (d)  $(1 + e^{-4})\pi$
  - (e)  $\frac{(1-e^{-4})\pi}{2}$

16. An equation of the tangent line to the curve

$$r = 2 + \sin \theta$$
 at  $\theta = \frac{\pi}{6}$ 

- (a)  $2y + (6\sqrt{3})x = 25$
- (b) x + y = 25
- (c)  $(6\sqrt{3})x y = 25$
- (d)  $(3\sqrt{3})y + x = 25$
- (e)  $25x y = 3\sqrt{3}$

- 17. If the maximum rate of change of  $f(x, y, z) = \frac{y+z}{x}$  at the point  $P(\sqrt{a}, 1, -1)$  is equal to 2, then the value of a is
  - (a) 1
  - (b) 0
  - (c)  $\frac{1}{3}$
  - (d)  $\frac{1}{2}$
  - (e)  $\frac{1}{4}$

18. An equation of the tangent plane to the surface

$$z = 4x^3y^2 + 2y$$
 at the point  $(1, -2, 12)$ 

- (a) 48x 7y z 50 = 0
- (b) 24x 14y z 40 = 0
- (c) 48x + 7y z 22 = 0
- (d) 24x 7y z 26 = 0
- (e) 48x 14y z 64 = 0

- 19. If the point (4, -4, 2) is given in rectangular coordinates, then the cylindrical coordinates are given by
  - (a)  $\left(4\sqrt{2}, \frac{7\pi}{4}, 2\right)$
  - (b)  $(4\sqrt{2}, \frac{\pi}{4}, 2)$
  - (c)  $\left(4, \frac{7\sqrt{\pi}}{4}, 2\right)$
  - (d)  $\left(4\sqrt{2}, \frac{3\pi}{4}, 2\right)$
  - (e)  $(4\sqrt{2}, 0, 2)$

- 20. A function f satisfies  $f_x = x^2 + Axy + 3y^2$  and  $f_y = x^2 + Bxy + y^2$  for some constants A and B. Then A + B is equal to
  - (a) 4
  - (b) 6
  - (c) 2
  - (d) 8
  - (e) 0

2 3	a	b	С	d	e	f
3		b	$^{\mathrm{c}}$	d	е	f
J	a	b	С	d	е	f
4	a	b	c	d	е	f
5	a	b	С	d	е	f
6	a	b	c	d	е	f
7	a	b	c	d	е	f
8	a	b	c	d	е	f
9	a	b	c	d	е	f
10	a	b	c	d	е	f
11	a	b	$\mathbf{c}$	d	е	f
12	a	b	c	d	е	f
13	a	b	c	d	e	f
14	a	b	$\mathbf{c}$	d	e	f
15	a	b	$\mathbf{c}$	d	e	f
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18	a	b	$\mathbf{c}$	d	e	f
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25	a	b	c	d	e	f
26	a	b	c	d	e	f
27	a	b	c	d	е	f
28	a	b	c	d	e	f
29	a	b	c	d	е	f
30	a	b	c	d	e	f
31	a	b	c	d	е	f
32	a	b	$\mathbf{c}$	d	e	f
33	a	b	c	d	е	f
34	a	b	c	d	е	f
35	a	b	$\mathbf{c}$	d	е	f

36	a	b	c	d	е	f
37	a	b	c	d	е	f
38	a	b	c	d	е	f
39	a	b	$^{\mathrm{c}}$	d	е	f
40	a	b	c	d	e	f
41	a	b	c	d	е	f
42	a	b	$\mathbf{c}$	d	e	f
43	a	b	$\mathbf{c}$	d	e	f
44	a	b	c	d	е	f
45	a	b	$\mathbf{c}$	d	e	f
46	a	b	c	d	е	f
47	a	b	c	d	е	f
48	a	b	С	d	е	f
49	a	b	c	d	е	f
50	a	b	c	d	е	f
51	a	b	С	d	е	f
52	a	b	С	d	е	f
53	a	b	С	d	е	f
54	a	b	С	d	е	f
55	a	b	С	d	е	f
56	a	b	c	d	е	f
57	a	b	С	d	е	f
58	a	b	С	d	е	f
59	a	b	c	d	е	f
60	a	b	$^{\mathrm{c}}$	d	е	f
61	a	b	c	d	е	f
62	a	b	С	d	е	f
63	a	b	c	d	е	f
64	a	b	$^{\mathrm{c}}$	d	е	f
65	a	b	c	d	е	f
66	a	b	$^{\mathrm{c}}$	d	е	f
67	a	b	c	d	е	f
68	a	b	$\mathbf{c}$	d	e	f
69	a	b	c	d	е	f
70	a.	h	С	d	e	f

Q	MM	V1	V2	V3	V4
1	a	b	С	С	С
2	a	a	С	С	е
3	a	С	b	е	е
4	a	С	е	a	c
5	a	d	a	е	a
6	a	С	С	a	е
7	a	е	е	d	С
8	a	a	b	d	b
9	a	е	С	С	е
10	a	b	b	d	a
11	a	е	С	a	b
12	a	c	С	a	c
13	a	С	b	a	b
14	a	е	е	b	е
15	a	d	С	С	е
16	a	е	С	С	a
17	a	d	a	е	d
18	a	d	С	С	е
19	a	b	b	d	a
20	a	b	b	b	d

# Answer Counts

V	a	b	c	d	е
1	4	4	5	2	5
2	6	5	3	3	3
3	2	8	3	3	4
4	3	5	5	2	5