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

This exam was prepared using mcqs
For questions send an email to Dr. Ibrahim Al-Lehyani (iallehyani@kaau.edu.sa)

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Department of Mathematics and Statistics

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Term 102
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Net Time Allowed: 180 minutes

MASTER VERSION

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

(a) $\dfrac{1}{4}$

(b) $\dfrac{1}{5}$

(c) $\dfrac{1}{2}$

(d) 1

(e) 0

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

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

is equal to

(a) $\dfrac{49\pi}{16}$

(b) 16π

(c) π

(d) $\dfrac{49\pi}{11}$

(e) $\dfrac{\pi}{11}$

3. An equation of the tangent line to the curve

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

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) $(\sqrt{2}, 1)$

5. The equation

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

represents

(a) a cone

(b) a hyperboloid of one sheet

(c) an ellipsoid

(d) a hyperbolic paraboloid

(e) an elliptic paraboloid

6. The distance from the plane $x - 2y + 2z = 1$ to the plane $-2x + 4y - 4z = 3$ 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 $\dfrac{\partial u}{\partial t}$ when $s = 1$, $t = 2$ is

(a) $\dfrac{3}{122}$

(b) $\dfrac{2}{122}$

(c) $\dfrac{5}{122}$

(d) $\dfrac{1}{4}$

(e) $\dfrac{1}{122}$

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

(a) $\dfrac{1}{2}$

(b) 1

(c) $\dfrac{1}{3}$

(d) 0

(e) $\dfrac{1}{4}$

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 $R = \{(x, y) | \ x^2 + 2y^2 \leq 4\}$ 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

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

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

(a) $4e$

(b) $2e$

(c) e

(d) $3e$

(e) 0

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) 8

(b) 6

(c) 4

(d) 2

(e) 0

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

(a) $\dfrac{1}{30}$

(b) $\dfrac{1}{35}$

(c) $\dfrac{1}{20}$

(d) $\dfrac{1}{25}$

(e) $\dfrac{1}{10}$

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) $\dfrac{64}{15}$

(b) $\dfrac{2\pi}{3}$

(c) $\dfrac{5\pi}{3}$

(d) $\dfrac{3\pi}{2}$

(e) $\dfrac{3}{4}$

16. The value of the iterated integral

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

is equal to

(a) $\dfrac{1}{12}$

(b) $\dfrac{2}{9}$

(c) 0

(d) $4\sqrt{2}$

(e) $\dfrac{\sqrt{2}}{2}$

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 $x = \sqrt{4 - y^2}$ an 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) $\pi - \frac{e^{-4}}{2}$

19. 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

(a) $\frac{16\pi}{3}$

(b) $\frac{2\pi}{3}$

(c) $\frac{8\pi}{3}$

(d) $\frac{4\pi}{3}$

(e) $\frac{\pi}{3}$

20. 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) $\left(4\sqrt{2}, \frac{\pi}{4}, 2\right)$

(c) $\left(4, \frac{7\sqrt{\pi}}{4}, 2\right)$

(d) $(4\sqrt{2}, 0, 2)$

(e) $\left(4\sqrt{2}, \frac{3\pi}{4}, 2\right)$

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Department of Mathematics and Statistics

CODE 001 **Math 201** **CODE 001**

Final Exam

Term 102

Thursday, June 9, 2011

Net Time Allowed: 180 minutes

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ID: ________________ Sec: ________________.

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1. The absolute maximum value of $f(x, y) = x^2 - 2y^2 + 4y - 1$ on the region $R = \{(x, y)|\ x^2 + 2y^2 \leq 4\}$ 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) $\dfrac{64\pi}{9}$

(b) $\dfrac{\pi}{9} + 4$

(c) $\dfrac{32}{9}(3\pi - 4)$

(d) $\dfrac{3\pi}{4} + \dfrac{64}{9}$

(e) $\dfrac{64\pi}{3}$

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

(a) $(1 + e^{-4})\pi$

(b) $\dfrac{\pi}{e^4}$

(c) $\dfrac{(1 - e^{-4})\pi}{2}$

(d) $2\pi e^{-4}$

(e) $\pi - \dfrac{e^{-4}}{2}$

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 $\dfrac{\partial u}{\partial t}$ when $s = 1$, $t = 2$ is

(a) $\dfrac{1}{122}$

(b) $\dfrac{2}{122}$

(c) $\dfrac{3}{122}$

(d) $\dfrac{1}{4}$

(e) $\dfrac{5}{122}$

7. 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) $\frac{2\pi}{3}$

(b) $\frac{3\pi}{2}$

(c) $\frac{3}{4}$

(d) $\frac{5\pi}{3}$

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

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

(a) $4e$

(b) $2e$

(c) 0

(d) e

(e) $3e$

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

(a) 0

(b) $\dfrac{1}{4}$

(c) 1

(d) $\dfrac{1}{3}$

(e) $\dfrac{1}{2}$

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 $\displaystyle\iiint_E y^2\, dV$ is equal to

(a) $\dfrac{1}{20}$

(b) $\dfrac{1}{30}$

(c) $\dfrac{1}{10}$

(d) $\dfrac{1}{25}$

(e) $\dfrac{1}{35}$

11. The value of the iterated integral

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

is equal to

(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

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

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

15. The distance from the plane $x - 2y + 2z = 1$ to the plane $-2x + 4y - 4z = 3$ is equal to

(a) $\frac{5}{3}$

(b) $\frac{7}{6}$

(c) $\frac{1}{3}$

(d) $\frac{5}{6}$

(e) 0

16. 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

(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

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

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 $\left.\dfrac{d^2y}{dx^2}\right|_{t=0}$ is equal to

(a) $\dfrac{1}{2}$

(b) $\dfrac{1}{5}$

(c) 0

(d) $\dfrac{1}{4}$

(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

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

is equal to

(a) $\frac{\pi}{11}$

(b) $\frac{49\pi}{16}$

(c) $\frac{49\pi}{11}$

(d) 16π

(e) π

Name ....

ID .... Sec ....

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
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64	a	b	c	d	e	f
65	a	b	c	d	e	f
66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

King Fahd University of Petroleum & Minerals
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CODE 002	Math 201	CODE 002

Final Exam
Term 102
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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

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

is equal to

(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 $R = \{(x, y)|\ x^2 + 2y^2 \leq 4\}$ is

(a) $\frac{15}{4}$

(b) 5

(c) 4

(d) 1

(e) $\frac{3}{5}$

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

(a) 1

(b) $\dfrac{1}{5}$

(c) $\dfrac{1}{2}$

(d) 0

(e) $\dfrac{1}{4}$

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

(a) $\pi - \dfrac{e^{-4}}{2}$

(b) $\dfrac{(1 - e^{-4})\pi}{2}$

(c) $2\pi e^{-4}$

(d) $(1 + e^{-4})\pi$

(e) $\dfrac{\pi}{e^4}$

9. The distance from the plane $x - 2y + 2z = 1$ to the plane $-2x + 4y - 4z = 3$ 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

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

is equal to

(a) $\frac{3\pi}{2}$

(b) $\frac{64}{15}$

(c) $\frac{5\pi}{3}$

(d) $\frac{3}{4}$

(e) $\frac{2\pi}{3}$

11. The volume of the solid region inside the sphere $x^2 + y^2 + z^2 = 4$ and between the cones $\phi = \dfrac{\pi}{3}$ and $\phi = \dfrac{2\pi}{3}$ is equal to

(a) $\dfrac{\pi}{3}$

(b) $\dfrac{4\pi}{3}$

(c) $\dfrac{16\pi}{3}$

(d) $\dfrac{8\pi}{3}$

(e) $\dfrac{2\pi}{3}$

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) A saddle point at $(0, 0)$ and a local maximum at $(1, 1)$

(c) A saddle point at $(0, 0)$ and a local minimum at $(1, 1)$

(d) A local maximum at $(0, 0)$ and a local minimum at $(1, 1)$

(e) Two saddle points at $(0, 0)$ and $(1, 1)$

13. If $u = \tan^{-1}(x + 2y), x = e^{2s-t}, y = 1 + 2st$ then the value of $\dfrac{\partial u}{\partial t}$ when $s = 1$, $t = 2$ is

(a) $\dfrac{1}{122}$

(b) $\dfrac{3}{122}$

(c) $\dfrac{5}{122}$

(d) $\dfrac{1}{4}$

(e) $\dfrac{2}{122}$

14. An equation of the tangent plane to the surface

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

is

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

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

15. If $f(x,y) = \dfrac{y^2 e^{3\sin y}}{\cos y} + x^2 y e^y$, 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 $\displaystyle\iiint_E y^2\, dV$ is equal to

(a) $\dfrac{1}{20}$

(b) $\dfrac{1}{10}$

(c) $\dfrac{1}{30}$

(d) $\dfrac{1}{25}$

(e) $\dfrac{1}{35}$

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

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

is equal to

(a) π

(b) 16π

(c) $\dfrac{49\pi}{16}$

(d) $\dfrac{\pi}{11}$

(e) $\dfrac{49\pi}{11}$

19. An equation of the tangent line to the curve

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

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 $f(x, y, z) = \dfrac{y+z}{x}$ 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

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ID .... Sec ....

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66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

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

CODE 003 | **Math 201** | **CODE 003**

Final Exam

Term 102

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.

1. 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) $\frac{5\pi}{3}$

(b) $\frac{3\pi}{2}$

(c) $\frac{64}{15}$

(d) $\frac{3}{4}$

(e) $\frac{2\pi}{3}$

2. 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) $\frac{1}{4}$

(b) 1

(c) $\frac{1}{2}$

(d) 0

(e) $\frac{1}{3}$

3. An equation of the tangent line to the curve

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

is

(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 $\iiint\limits_E y^2\, dV$ is equal to

(a) $\dfrac{1}{30}$

(b) $\dfrac{1}{35}$

(c) $\dfrac{1}{10}$

(d) $\dfrac{1}{25}$

(e) $\dfrac{1}{20}$

5. If the point $(4, -4, 2)$ is given in rectangular coordinates, then the cylindrical coordinates are given by

(a) $\left(4, \dfrac{7\sqrt{\pi}}{4}, 2\right)$

(b) $\left(4\sqrt{2}, \frac{\pi}{4}, 2\right)$

(c) $\left(4\sqrt{2}, \dfrac{3\pi}{4}, 2\right)$

(d) $(4\sqrt{2}, 0, 2)$

(e) $\left(4\sqrt{2}, \dfrac{7\pi}{4}, 2\right)$

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

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

is

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

(a) $3e$

(b) 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

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

is equal to

(a) 0

(b) $\frac{2}{9}$

(c) $4\sqrt{2}$

(d) $\frac{1}{12}$

(e) $\frac{\sqrt{2}}{2}$

11. 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

(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

(c) a hyperboloid of one sheet

(d) an elliptic paraboloid

(e) a hyperbolic paraboloid

13. If $u = \tan^{-1}(x+2y), x = e^{2s-t}, y = 1 + 2st$ then the value of $\dfrac{\partial u}{\partial t}$ when $s = 1$, $t = 2$ is

(a) $\dfrac{3}{122}$

(b) $\dfrac{1}{122}$

(c) $\dfrac{1}{4}$

(d) $\dfrac{2}{122}$

(e) $\dfrac{5}{122}$

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

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

is equal to

(a) $\dfrac{\pi}{11}$

(b) $\dfrac{49\pi}{16}$

(c) 16π

(d) π

(e) $\dfrac{49\pi}{11}$

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

(a) 1

(b) $\dfrac{15}{4}$

(c) 4

(d) 5

(e) $\dfrac{3}{5}$

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) $\dfrac{64\pi}{9}$

(b) $\dfrac{3\pi}{4} + \dfrac{64}{9}$

(c) $\dfrac{32}{9}(3\pi - 4)$

(d) $\dfrac{\pi}{9} + 4$

(e) $\dfrac{64\pi}{3}$

17. 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) $(\sqrt{2}, 1)$

(e) $(-2\sqrt{2}, -1)$

18. The distance from the plane $x - 2y + 2z = 1$ to the plane $-2x + 4y - 4z = 3$ 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 $\left.\dfrac{d^2y}{dx^2}\right|_{t=0}$ is equal to

(a) 1

(b) 0

(c) $\dfrac{1}{2}$

(d) $\dfrac{1}{4}$

(e) $\dfrac{1}{5}$

20. 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

(a) $2\pi e^{-4}$

(b) $\dfrac{(1 - e^{-4})\pi}{2}$

(c) $(1 + e^{-4})\pi$

(d) $\dfrac{\pi}{e^4}$

(e) $\pi - \dfrac{e^{-4}}{2}$

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66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

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

CODE 004 **Math 201** CODE 004

Final Exam

Term 102

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.
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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. The equation

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

represents

(a) an elliptic paraboloid

(b) an ellipsoid

(c) a cone

(d) a hyperbolic paraboloid

(e) a hyperboloid of one sheet

2. 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

(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 $\mathcal{C}$ 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) $(\sqrt{2}, 1)$

(c) $(-2\sqrt{2}, -1)$

(d) $(2\sqrt{2}, 1)$

(e) $(-2\sqrt{2}, 1)$

5. 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) $\frac{3}{4}$

(c) $\frac{3\pi}{2}$

(d) $\frac{5\pi}{3}$

(e) $\frac{2\pi}{3}$

6. The distance from the plane $x - 2y + 2z = 1$ to the plane $-2x + 4y - 4z = 3$ is equal to

(a) 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 $\left.\dfrac{d^2y}{dx^2}\right|_{t=0}$ is equal to

(a) $\dfrac{1}{5}$

(b) 1

(c) $\dfrac{1}{4}$

(d) 0

(e) $\dfrac{1}{2}$

8. The value of the iterated integral

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

is equal to

(a) $\dfrac{2}{9}$

(b) $\dfrac{1}{12}$

(c) $\dfrac{\sqrt{2}}{2}$

(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) 0

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

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

is equal to

(a) $\frac{\pi}{11}$

(b) π

(c) $\frac{49\pi}{11}$

(d) 16π

(e) $\frac{49\pi}{16}$

15. 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

(a) $2\pi e^{-4}$

(b) $\pi - \dfrac{e^{-4}}{2}$

(c) $\dfrac{\pi}{e^4}$

(d) $(1 + e^{-4})\pi$

(e) $\dfrac{(1 - e^{-4})\pi}{2}$

16. An equation of the tangent line to the curve

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

is

(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 $f(x, y, z) = \dfrac{y + z}{x}$ at the point $P(\sqrt{a}, 1, -1)$ is equal to 2, then the value of a is

(a) 1

(b) 0

(c) $\dfrac{1}{3}$

(d) $\dfrac{1}{2}$

(e) $\dfrac{1}{4}$

18. An equation of the tangent plane to the surface

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

is

(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) $\left(4\sqrt{2}, \frac{\pi}{4}, 2\right)$

(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. 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

Name ....

ID .... Sec ....

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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
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
35	a	b	c	d	e	f

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

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

Answer Counts

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