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ASSALAM O ALIKUM all fellows
ALL IN ONE MTH301 MIDTERM PAPERS solved (4)
SOLVED BY Farhan & Ali
BS (cs) 2nd sem
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Remember us in your prayers

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MIDTERM EXAMINATION

Spring 2010
MTH301- Calculus II

Ref No: 1499814
Time: 60 min
Marks: 40

Student Info	
Student ID:	
Center:	
Exam Date:	

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Q No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Marks									
Q No.	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
Marks									
Q No.	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	
Marks									
Q No.	**25**	**26**							
Marks									

Question No: 1 (Marks: 1) - Please choose one

Every point in three dimensional space can be described by ------- coordinates.

► Two

► **Three**

► Four

► Eight

Question No: 2 (Marks: 1) - Please choose one

What are the direction cosines for the line joining the points (1, 3, 2) and (7, -2, 3)?

► $\frac{1}{7}, \frac{-3}{2}$ *and* $\frac{2}{3}$

► $\frac{7}{11}, \frac{-6}{11}$ *and* $\frac{6}{11}$

► $\frac{8}{3\sqrt{10}}, \frac{1}{3\sqrt{10}}$ *and* $\frac{5}{3\sqrt{10}}$

► $\frac{6}{\sqrt{62}}, \frac{-5}{\sqrt{62}}$ *and* $\frac{1}{\sqrt{62}}$

Question No: 3 (Marks: 1) - Please choose one

The angles which a line makes with positive x ,y and z-axis are known as ------------

► Direction cosines

► Direction ratios

► **Direction angles**

Question No: 4 (Marks: 1) - Please choose one

Which of the following is geometrical representation of the equation $y = 4$, in three dimensional space?

► A point on y-axis (Farhan)

► Plane parallel to xy-plane

► Plane parallel to yz-axis

► **Plane parallel to xz-plane (Ali)**

Question No: 5 (Marks: 1) - Please choose one

Domain of the function $f(x, y, z) = \sqrt{x^2 + y^2 + z^2}$ is

► **Entire 3D-Space**

► Entire 3D-Space except origin

► $(0, \infty)$

► $(-\infty, \infty)$

Question No: 6 (Marks: 1) - Please choose one

If $f(x, y) = x^2 y - y^3 + \ln x$

then $\frac{\partial^2 f}{\partial x^2} =$

► $2xy + \frac{1}{x^2}$

► $2y + \frac{1}{x^2}$

► $2xy - \frac{1}{x^2}$

► $2y - \frac{1}{x^2}$

Question No: 7 (Marks: 1) - Please choose one

Suppose $f(x, y) = xy - 2y^2$ *where* $x = 3t + 1$ *and* $y = 2t$. Which one of the following is true?

► $\frac{df}{dt} = -4t + 2$

► $\frac{df}{dt} = -16t - t$

► $\frac{df}{dt} = 18t + 2$

► $\frac{df}{dt} = -10t^2 + 8t + 1$

Question No: 8 (Marks: 1) - Please choose one

For a function $f(x, y, z)$, the equation $\frac{\partial^2 f}{\partial^2 x} + \frac{\partial^2 f}{\partial^2 y} + \frac{\partial^2 f}{\partial^2 z} = 0$ is known as -------------

► Gauss Equation

► Euler's equation

► **Laplace's Equation (Ali)**

► Stoke's Equation

Question No: 9 (Marks: 1) - Please choose one

Magnitude of vector $\vec{a}$ is 2, magnitude of vector $\vec{b}$ is 3 and angle between them when placed tail to tail is 45 degrees. What is $\vec{a} \cdot \vec{b}$?

► 4.5

► 6.2

► 5.1

► **4.2**

Question No: 10 (Marks: 1) - Please choose one

Is the function $f(x, y)$ continuous at origin? If not, why?

$$f(x, y) = \frac{xy}{x^2 + y^2}$$

► $f(x, y)$ is continuous at origin

► $\lim_{(x,y)\to(0,0)} f(x, y)$ does not exist

► $f(0, 0)$ is defined and $\lim_{(x,y)\to(0,0)} f(x, y)$ exists but these two numbers are not equal.

Question No: 11 (Marks: 1) - Please choose one

Let R be a closed region in two dimensional space. What does the double integral over R calculates?

► Area of R.??(ali)

► **Radius of inscribed circle in R**

► Distance between two endpoints of R.

► None of these

Question No: 12 (Marks: 1) - Please choose one

Which of the following formula can be used to find the Volume of a parallelepiped with adjacent edges formed by the vectors a , b *and* c?

► $\left|a \times \left(b \times c\right)\right|$

► $\left|a\,\mathrm{g}\left(b\,\mathrm{g}c\right)\right|$

► $\left|a\,\mathrm{g}\left(b \times c\right)\right|$

► $\left|a \times \left(b\,\mathrm{g}c\right)\right|$

Question No: 13 (Marks: 1) - Please choose one

Two surfaces are said to be orthogonal at a point of their intersection if their normals at that point are ---------

► Parallel

► **Perpendicular**

► In opposite direction

Question No: 14 (Marks: 1) - Please choose one

Two surfaces are said to intersect orthogonally if their normals at every point common to them are ----------

► perpendicular

► parallel

► **In opposite direction (Farhan)**

Question No: 15 (Marks: 1) - Please choose one

Let the function $f(x, y)$ has continuous second-order partial derivatives $\left(f_{xx}\ ,\ f_{yy}\ and\ f_{xy}\right)$ in some circle centered at a critical point (x_0, y_0) and let $D = f_{xx}(x_0, y_0)\ f_{yy}(x_0, y_0) - f_{xy}^{\ 2}(x_0, y_0)$

If $D > 0$ and $f_{xx}(x_0, y_0) < 0$ then f has ---------------

► **Relative maximum at** (x_0, y_0)

► Relative minimum at (x_0, y_0)

► Saddle point at (x_0, y_0)

► No conclusion can be drawn.

Question No: 16 (Marks: 1) - Please choose one

Let the function $f(x, y)$ has continuous second-order partial derivatives $\left(f_{xx} ,\ f_{yy}\ and\ f_{xy} \right)$ in some circle centered at a critical point (x_0, y_0) and let $D = f_{xx}(x_0, y_0)\, f_{yy}(x_0, y_0) - f_{xy}^{\ 2}(x_0, y_0)$

If $D = 0$ then ---------------

► f has relative maximum at (x_0, y_0)

► f has relative minimum at (x_0, y_0)

► f has saddle point at (x_0, y_0)

► **No conclusion can be drawn.**

Question No: 17 (Marks: 1) - Please choose one

$If\ R = \{(x, y) / 0 \le x \le 2\ and\ 1 \le y \le 4\}, then$

$\iint_R (6x^2 + 4xy^3) dA =$

► $\int_1^4 \int_0^2 (6x^2 + 4xy^3) dydx$

► $\int_0^2 \int_1^4 (6x^2 + 4xy^3) dxdy$

► $\int_1^4 \int_0^2 (6x^2 + 4xy^3) dxdy$

► $\int_{2}^{4}\int_{0}^{1} (6x^2+4xy^3)dxdy$

Question No: 18 (Marks: 1) - Please choose one

$If\ R=\{(x,y)/0\le x\le 2\ and\ -1\le y\le 1\},then$

$\iint_R (x+2y^2)dA=$

► $\int_{-1}^{1}\int_{0}^{2} (x+2y^2)dydx$

► $\int_{0}^{2}\int_{1}^{-1} (x+2y^2)dxdy$

► $\int_{-1}^{1}\int_{0}^{2} (x+2y^2)dxdy$

► $\int_{1}^{2}\int_{-1}^{0} (x+2y^2)dxdy$

Question No: 19 (Marks: 1) - Please choose one

$If\ R=\{(x,y)/2\le x\le 4\ and\ 0\le y\le 1\},then$

$\iint_R (4xe^{2y})dA=$

► $\int_{0}^{1}\int_{2}^{4} (4xe^{2y})dydx$

► $\int_{0}^{1}\int_{2}^{4} (4xe^{2y})dxdy$

► $\int_1^4 \int_0^2 (4xe^{2y})dxdy$

► $\int_1^4 \int_0^2 (4xe^{2y})dydx$

Question No: 20 (Marks: 1) - Please choose one

$If\ R = \{(x, y) / 0 \le x \le 4\, and\, 0 \le y \le 9\}, then$
$\iint_R (3x - 4x\sqrt{xy})dA =$

► $\int_0^9 \int_0^4 (3x - 4x\sqrt{xy})dydx$

► $\int_0^4 \int_4^9 (3x - 4x\sqrt{xy})dxdy$

► $\int_4^9 \int_0^0 (3x - 4x\sqrt{xy})dxdy$

► $\int_0^4 \int_0^9 (3x - 4x\sqrt{xy})dydx$

Question No: 21 (Marks: 2)

Suppose that the surface $f(x, y, z)$ has continuous partial derivatives at the point (a, b, c). Write down the equation of tangent plane at this point.

Question No: 22 (Marks: 2)

Evaluate the following double integral.

$$\iint (3x - y)\ dy\ dx$$

$$\iint \left(3x^2 y/2 - xy^2/2\right)\ dx \int \iint (3x - y)\ dy\ dx$$

$$\int \frac{3x^1 y}{1} - \frac{y^2}{2} dx$$

$$\frac{3x^2 y}{2} - \frac{xy^2}{2} + c$$

Answer

$$\int \frac{3x^1 y}{1} - \frac{y^2}{2} dx$$

$$\frac{3x^2 y}{2} - \frac{xy^2}{2} + c$$

Question No: 23 (Marks: 3)

Evaluate the following double integral.

$$\iint \left(3 + 2x - 3y^2\right)\ dx\ dy$$

$$= \int \left(3x + x^2 + 3xy^2\right) dy$$

$$= 3xy + x^2 y + 3xy^3$$

$$\iint \left(3 + 2x - 3y^2\right)\ dx\ dy$$

$$= \int \left(3x + x^2 + 3xy^2\right) dy$$

$$= 3xy + x^2 y + 3xy^3$$

Question No: 24 (Marks: 3)

Let $f(x,\ y,\ z) = yz^3 - 2x^2$

Find the gradient of f.

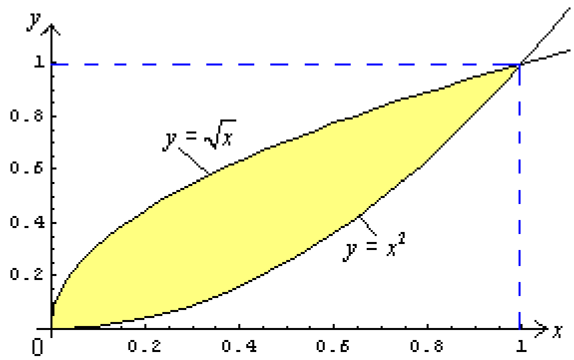
Question No: 25 (Marks: 5)

Find all critical points of the function

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

Question No: 26 (Marks: 5)

Use double integral in rectangular co-ordinates to compute area of the region bounded by the curves $y = x^2$ and $y = \sqrt{x}$.



PAPER NO.2

1. Every real number corresponds to_____________on the co-ordinate line.

- Infinite number of points
- Two points (one positive and one negative)
- A unique point??f
- None of these

2. There is one-to-one correspondence between the set of points on co-ordinate line and ___________.

- Set of real numbers
- Set of integers
- Set of natural numbers
- Set of rational numbers

3. Which of the following is associated to each point of three dimensional spaces?

- A real number
- An ordered pair
- An ordered triple

- **A natural Number**

4. All axes are positive in __________octant.

- **First**
- Second
- Fourth
- Eighth

5. The spherical co-ordinates of a point are $\left(\sqrt{3},\frac{\pi}{3},\frac{\pi}{2}\right)$.What are its cylindrical co-ordinates?

- $\left(\frac{\sqrt{3}}{2},\frac{3}{2},0\right)$
- $\left(\sqrt{3}\cos\frac{\pi}{3},\sqrt{3}\sin\frac{\pi}{3},0\right)$
- $\left(\sqrt{3}\sin\frac{\pi}{3},\frac{\pi}{2},\sqrt{3}\cos\frac{\pi}{3}\right)$
- $\left(\sqrt{3},\frac{\pi}{3},0\right)$

6. Suppose $f(x,y)=xy-2y^2$ *where* $x=3t+1$ *and* $y=2t$. Which one of the following is true?

- $\frac{df}{dt}=-4t+2$
- $\frac{df}{dt}=-16t-t$
- $\frac{df}{dt}=18t+2$
- $\frac{df}{dt}=-10t^2+8t+1$

7. Let $w=f(x,y,z)$ *and* $x=g(r,s)$, $y=h(r,s)$, $z=t(r,s)$ then by chain rule $\frac{\partial w}{\partial r}=$

- $\frac{\partial w}{\partial x}\frac{\partial x}{\partial r}+\frac{\partial w}{\partial y}\frac{\partial y}{\partial r}+\frac{\partial w}{\partial z}\frac{\partial z}{\partial r}$

- $\frac{\partial w}{\partial r}\frac{\partial x}{\partial r}+\frac{\partial w}{\partial r}\frac{\partial y}{\partial r}+\frac{\partial w}{\partial r}\frac{\partial z}{\partial r}$

- $\frac{\partial w}{\partial x}\frac{\partial x}{\partial r}\frac{\partial x}{\partial s}+\frac{\partial w}{\partial y}\frac{\partial y}{\partial r}\frac{\partial y}{\partial s}+\frac{\partial w}{\partial z}\frac{\partial z}{\partial r}\frac{\partial z}{\partial s}$

- $\frac{\partial w}{\partial r}\frac{\partial r}{\partial x}+\frac{\partial w}{\partial r}\frac{\partial r}{\partial y}+\frac{\partial w}{\partial r}\frac{\partial r}{\partial z}$

8. Magnitude of vector $\vec{a}$ is 2, magnitude of vector $\vec{b}$ is 3and angle between them when placed tail to tail is 45 degrees. What is$\vec{a}.\vec{b}$?

- 4.5
- **6.2**
- 5.1
- **4.2**

9. Is the function $f(x,y)$ continuous at origin? If not, why?

$$f(x,y) = \begin{cases} 0 \ \ if \ \ x \geq 0 \ and \ y \geq 0 \\ 1 \qquad\qquad otherwise \end{cases}$$

- $f(x,y)$ is continuous at origin
- $f(0,0)$ is not defined
- $f(0,0)$ is defined but $\lim_{(x,y)\to(0,0)} f(x,y)$ does not exist
- $f(0,0)$ is defined and $\lim_{(x,y)\to(0,0)} f(x,y)$ exist but these two numbers are not equal.

10. Is the function $f(x,y)$ continuous at origin? If not, Why?

$$f(x,y) = \begin{cases} \frac{3x^2y}{x^2+y^2} & if (x,y) \neq 0 \\ 0 & if \ (x,y) = 0 \end{cases}$$

- $f(x,y)$ is continuous at origin
- $f(0,0)$ **is not defined**
- $f(0,0)$ is defined but $\lim_{(x,y)\to(0,0)} f(x,y)$ does not exist

- $f(0,0)$ is defined and $\lim_{(x,y)\to(0,0)} f(x,y)$ exist but these two numbers are not equal.

11. Let R be a closed region in two dimensional space. What does the double integral over R calculates?

- Area of R
- **Radius of inscribed circle in R.**
- Distance between two endpoints of R.
- None of these

12. Which of the following formula can be used to find the volume of a parallelepiped with adjacent edges formed by the vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$?

- $|\vec{a} \times (\vec{b} \times \vec{c})|$
- $|\vec{a} . (\vec{b} . \vec{c})|$
- $|\vec{a} . (\vec{b} \times \vec{c})|$
- $|\vec{a} \times (\vec{b} . \vec{c})|$

13. Two surfaces are said to be orthogonal at appoint of their intersection if their normals at that point are__________.

- Parallel
- **Perpendicular**
- In opposite direction
- Same direction

14. By Extreme Value Theorem, if a function $f(x,y)$ is continuous on a closed and bounded set R, then $f(x,y)$ has both ___________ on R.

- **Absolute maximum and absolute minimum value**
- Relative maximum and relative minimum value
- Absolute maximum and relative minimum value
- Relative maximum and absolute minimum value

15. Let the function $f(x,y)$ has continuous second-order partial derivatives $(f_{xx}\ ,\ f_{yy}\ and\ f_{xy})$ in some circle centered at a critical point (x_0,y_0) and let $D=f_{xx}(x_0,y_0)\ f_{yy}(x_0,y_0)-f_{xy}^2(x_0,y_0)$ if

$D>0\ \ and\ \ f_{xx}(x_0,y_0)<0\ \ then\ \ f\ \ has$ ________ .

- **Relative maximum at** (x_0,y_0)
- Relative minimum at (x_0,y_0)
- Saddle point at (x_0,y_0)
- No conclusion can be drawn.

16. Let the function $f(x,y)$ has continuous second-order partial derivatives $(f_{xx}\ ,\ f_{yy}\ and\ f_{xy})$ in some circle centered at a critical point (x_0,y_0) and let $D=f_{xx}(x_0,y_0)\ f_{yy}(x_0,y_0)-f_{xy}^2(x_0,y_0)$ if

if $D=0$ then ________.

- f has relative maximum at (x_0,y_0)
- f has relative minimum at (x_0,y_0)
- f has saddle point at (x_0,y_0)
- **No conclusion can be drawn.**

17. $If\ \ R=R_1\cup R_2\ \ ,where\ \ R_1\ and\ \ R_2$ are no over lapping regions then

$\iint_{R_1} f(x,y)dA+\iint_{R_2} f(x,y)dA=$

- $\iint_{R} f(x,y)dA$
- $\iint_{R_1} f(x,y)dA\cup\iint_{R_2} f(x,y)dA$
- $\iint_{R} f(x,y)dV$
- $\iint_{R} f(x,y)dV\cap\iint_{R_2} f(x,y)dA$

18. *If* $R=\{(x,y)\,/\,0\le x\le 2 \;\; and \;\; 1\le y\le 4\}$ *,then* $\iint_R (6x^2+4xy^3)\,dA=$

- ➢ $\int_1^4\int_0^2 (6x^2+4xy^3)\,dydx$
- ➢ $\int_0^2\int_1^4 (6x^2+4xy^3)\,dydx$
- ➢ $\int_1^4\int_0^2 (6x^2+4xy^3)\,dydx$
- ➢ $\int_2^4\int_0^1 (6x^2+4xy^3)\,dydx$

19. *If* $R=\{(x,y)\,/\,2\le x\le 4 \;\; and \;\; 0\le y\le 1\}$, *then* $\iint_R (4xe^{2y})\,dA=$

- ➢ $\int_0^1\int_2^4 (4xe^{2y})\,dydx$
- ➢ $\int_0^1\int_2^4 (4xe^{2y})\,dxdy$
- ➢ $\int_1^4\int_0^2 (4xe^{2y})\,dxdy$
- ➢ $\int_1^4\int_0^2 (4xe^{2y})\,dydx$

20. *If* $R=\{(x,y)\,/\,0\le x\le 4 \;\; and \;\; 0\le y\le 9\}$ *,then* $\iint_R (3x-4x\sqrt{xy})\,dA=$

- ➢ $\int_0^9\int_0^4 (3x-4x\sqrt{xy})\,dydx$
- ➢ $\int_0^9\int_0^4 (3x-4x\sqrt{xy})\,dxdy$
- ➢ $\int_4^9\int_0^0 (3x-4x\sqrt{xy})\,dxdy$

➢ $\int_0^4\int_0^9 \left(3x-4x\sqrt{xy}\right)dydx$

21. Suppose that the surface $f\left(x,y,z\right)$ has continuous partial derivatives at the point $\left(a,b,c\right)$ Write down the equation of tangent plane at this point.

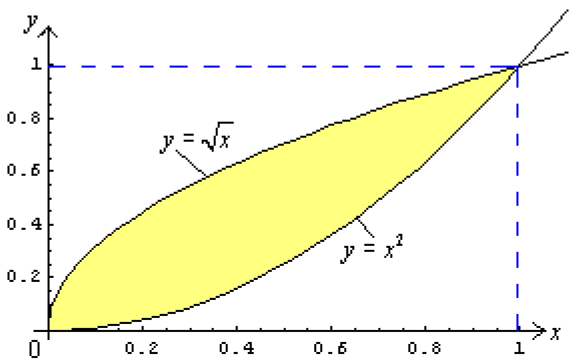
22. Evaluate the following double integral $\int\int\left(12xy^2-8x^3\right)dydx$.

23. Evaluate the following double integral $\int\int\left(3+2x-3y^2\right)dxdy$

24. Let $f\left(x,y,z\right)=xy^2e^z$ Find the gradient of f.

25. Find, Equation of Tangent plane to the surface $f\left(x,y,z\right)=x^2+y^2+z-9$ at the point $\left(1,2,4\right)$.

26. Use the double integral in rectangular co-ordinates to compute area of the region bounded by the curves $y=x^2$ *and* $y=\sqrt{x}$.



MIDTERM EXAMINATION
Spring 2010
MTH301- Calculus II (Session - 3)

Time: 60 min
Marks: 40

Student Info	
StudentID:	
Center:	**OPKST**
ExamDate:	**6/3/2010 12:00:00 AM**

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Q No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**

Marks								
Q No.	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
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Marks								
Q No.	**25**	**26**							
Marks								

Question No: 1 (Marks: 1) - Please choose one

Which of the following number is associated to each point on a co-ordinate line?

► An integer

► **A real number**

► A rational number

► A natural number

Question No: 2 (Marks: 1) - Please choose one

If $a > 0$, then the parabola $y = ax^2 + bx + c$ opens in which of the following direction?

► **Positive x - direction**

► Negative x - direction

► Positive y - direction

► Negative y - direction

Question No: 3 (Marks: 1) - Please choose one

Rectangular co-ordinate of a point is $(1, \sqrt{3}, -2)$. What is its spherical co-ordinate?

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

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

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

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

Question No: 4 (Marks: 1) - Please choose one

If a function is not defined at some point, then its limit ----------- exist at that point.

► Always

► Never

► **May**

Question No: 5 (Marks: 1) - Please choose one

Suppose $f(x, y) = x^3 e^{xy}$. Which one of the statements is correct?

▶ $\frac{\partial f}{\partial y} = 3x^3 e^{xy}$

▶ $\frac{\partial f}{\partial y} = x^3 e^{xy}$

▶ $\frac{\partial f}{\partial y} = x^4 e^{xy}$

▶ $\frac{\partial f}{\partial y} = x^3 y e^{xy}$

Question No: 6 (Marks: 1) - Please choose one

If $f(x, y) = x^2 y - y^3 + \ln x$

then $\frac{\partial^2 f}{\partial x^2}$ =

▶ $2xy + \frac{1}{x^2}$

▶ $2y + \frac{1}{x^2}$

▶ $2xy - \frac{1}{x^2}$

▶ $2y - \frac{1}{x^2}$

Question No: 7 (Marks: 1) - Please choose one

Suppose $f(x, y) = xy - 2y^2 \text{ where } x = 3t + 1 \text{ and } y = 2t$. Which one of the following is true?

▶ $\frac{df}{dt} = -4t + 2$

▶ $\frac{df}{dt} = -16t - t$

▶ $\frac{df}{dt} = 18t + 2$

▶ $\frac{df}{dt} = -10t^2 + 8t + 1$

Question No: 8 (Marks: 1) - Please choose one

Is the function $f(x, y)$ continuous at origin? If not, why?

$$f(x, y) = \begin{cases} 0 & If \ x \geq 0 \ and \ y \geq 0 \\ 1 & Otherwise \end{cases}$$

□□□□□□□□► □ $f(x, y)$ is continuous at origin
□□□□□□□□► □ $f(0, 0)$ is not defined
□□□□□□□□► □ $f(0, 0)$ is defined but $\lim_{(x,y)\to(0,0)} f(x, y)$ does not exist
□□□□□□□□► □ $f(0, 0)$ is defined and $\lim_{(x,y)\to(0,0)} f(x, y)$ exists but these two numbers are not equal.

Question No: 9 (Marks: 1) - Please choose one

What is the relation between the direction of gradient at any point on the surface to the tangent plane at that point ?

□□□□□□□□► □parallel
□□□□□□□□► □perpendicular
□□□□□□□□► □opposite direction
□□□□□□□□► □No relation between them.

Question No: 10 (Marks: 1) - Please choose one

Two surfaces are said to intersect orthogonally if their normals at every point common to them are ----------

► perpendicular
► parallel
► in opposite direction

Question No: 11 (Marks: 1) - Please choose one

By Extreme Value Theorem, if a function $f(x, y)$ is continuous on a closed and bounded set R, then $f(x, y)$ has both ---------------- on R.

► Absolute maximum and absolute minimum value
► Relative maximum and relative minimum value

Question No: 12 (Marks: 1) - Please choose one

Let the function $f(x, y)$ has continuous second-order partial derivatives $\left(f_{xx} , \ f_{yy} \ and \ f_{xy} \right)$ in some circle centered at a critical point (x_0, y_0) and let

$$D = f_{xx}(x_0, y_0) \ f_{yy}(x_0, y_0) - f_{xy}{}^2 (x_0, y_0)$$

If $D > 0$ and $f_{xx}(x_0, y_0) < 0$ then f has ---------------

► **Relative maximum at** (x_0, y_0)

► Relative minimum at (x_0, y_0)

► Saddle point at (x_0, y_0)

► No conclusion can be drawn.

Question No: 13 (Marks: 1) - Please choose one

Let the function $f(x, y)$ has continuous second-order partial derivatives $\left(f_{xx}\ ,\ f_{yy}\ and\ f_{xy} \right)$ in some circle centered at a critical point (x_0, y_0) and let $D = f_{xx}(x_0, y_0)\ f_{yy}(x_0, y_0) - f_{xy}^{\ 2}(x_0, y_0)$

If $D = 0$ then ---------------

► f has relative maximum at (x_0, y_0)

► f has relative minimum at (x_0, y_0)

► f has saddle point at (x_0, y_0)

► **No conclusion can be drawn.**

Question No: 14 (Marks: 1) - Please choose one

The function $f(x, y) = \sqrt{y - x}$ is continuous in the region --------- and discontinuous elsewhere.

► $x \neq y$

► $x \leq y$

► $x > y$

Question No: 15 (Marks: 1) - Please choose one

Plane is an example of ---------------------

► Curve

► **Surface**

► Sphere

► Cone

Question No: 16 (Marks: 1) - Please choose one

If $R = R_1 \cup R_2$, where R_1 and R_2 are no overlapping regions then

$\iint_{R_1} f(x, y)\, dA \quad + \quad \iint_{R_2} f(x, y)$

▶ $\iint_R f(x, y)\, dA$

▶ $\iint_{R_1} f(x, y)\, dA \quad \iint_{R_2} f(x$

▶ $\iint_R f(x, y)\, dV$

▶ $\iint_{R_1} f(x, y)\, dA \quad \iint_{R_2} f(x$

Question No: 17 (Marks: 1) - Please choose one

$If\ R = \{(x, y) / 0 \le x \le 2\ and\ 1 \le y \le 4\}, then$

$\iint_R (6x^2 + 4xy^3)dA =$

▶ $\int_1^4 \int_0^2 (6x^2 + 4xy^3)dydx$

▶ $\int_0^2 \int_1^4 (6x^2 + 4xy^3)dxdy$

▶ $\int_1^4 \int_0^2 (6x^2 + 4xy^3)dxdy$

▶ $\int_2^4 \int_0^1 (6x^2 + 4xy^3)dxdy$

Question No: 18 (Marks: 1) - Please choose one

$If\ R = \{(x, y) / 0 \le x \le 2\ and\ -1 \le y \le 1\}, then$

$\iint_R (x + 2y^2)dA =$

▶ $\int_{-1}^1 \int_0^2 (x + 2y^2)dydx$

▶ $\int_0^2 \int_1^{-1} (x + 2y^2)dxdy$

- ► $\int_{-1}^{1}\int_{0}^{2}(x+2y^2)dxdy$
- ► $\int_{1}^{2}\int_{-1}^{0}(x+2y^2)dxdy$

Question No: 19 (Marks: 1) - Please choose one

If $R=\{(x,y)/0\le x\le 2\ and\ 0\le y\le 3\}, then$

$\iint_R (1-ye^{xy})dA=$

- ► $\int_{0}^{2}\int_{0}^{3}(1-ye^{xy})dydx$
- ► $\int_{0}^{2}\int_{0}^{3}(1-ye^{xy})dxdy$
- ► $\int_{2}^{3}\int_{0}^{0}(1-ye^{xy})dxdy$
- ► $\int_{0}^{2}\int_{2}^{3}(4xe^{2y})dydx$

Question No: 20 (Marks: 1) - Please choose one

If $R=\{(x,y)/0\le x\le 4\ and\ 0\le y\le 9\}, then$

$\iint_R (3x-4x\sqrt{xy})dA=$

- ► $\int_{0}^{9}\int_{0}^{4}(3x-4x\sqrt{xy})dydx$
- ► $\int_{0}^{4}\int_{4}^{9}(3x-4x\sqrt{xy})dxdy$
- ► $\int_{4}^{9}\int_{0}^{0}(3x-4x\sqrt{xy})dxdy$
- ► $\int_{0}^{4}\int_{0}^{9}(3x-4x\sqrt{xy})dydx$

Question No: 21 (Marks: 2)

Evaluate the following double integral.

$\iint\left(2xy+y^3\right)\ dx\ dy$

Question No: 22 (Marks: 2)

$$Let\ f(x, y) = 2 + x^2 + \frac{y^2}{4}$$

Find the gradient of f

Question No: 23 (Marks: 3)

Evaluate the following double integral.

$$\iint \left(3 + 2x - 3y^2\right)\, dx\, dy$$

Question No: 24 (Marks: 3)

$$Let\ f(x, y, z) = yz^3 - 2x^2$$

Find the gradient of f.

Question No: 25 (Marks: 5)

Find Equation of a Tangent plane to the surface $f(x, y, z) = x^2 + 3y + z^3 - 9$ at the point $(2, -1, 2)$

Question No: 26 (Marks: 5)

Evaluate the iterated integral

$$\int_2^4 \int_{\frac{x}{2}}^{\sqrt{x}} \left(xy\right)\, dy\, dx$$

MTH301 Calculus II

Question No : 1 of 26 — **Marks: 1 (Budgeted Time 1 Min)**

Every real number corresponds to ---------- on the co-ordinate line.

Answer (Please select your correct option)

- Infinite number of points
- Two points (one positive and one negative)
- A unique point
- None of these

MTH301 Calculus II

Question No : 2 of 26 — **Marks: 1 (Budgeted Time 1 Min)**

There is one-to-one correspondence between the set of points on co-ordinate line and -----------

Answer (Please select your correct option)

- Set of real numbers
- Set of integers
- Set of natural numbers
- Set of rational numbers

MTH301 Calculus II

Question No : 3 of 26 Marks: 1 (Budgeted Time 1 Min)

Which of the following is associated to each point of three dimensional space?

Answer (Please select your correct option)

- A real number
- An ordered pair
- An ordered triple
- A natural number

MTH301 Calculus II

Question No : 4 of 26 Marks: 1 (Budgeted Time 1 Min)

All axes are positive in ----------- octant.

Answer (Please select your correct option)

- First
- Second
- Fourth
- Eighth

MTH301 Calculus II

Question No : 5 of 26 Marks: 1 (Budgeted Time 1 Min)

The spherical co-ordinates of a point are $\left(\sqrt{3}, \frac{\pi}{3}, \frac{\pi}{2}\right)$. What are its cylinderical co-ordinates?

Answer (Please select your correct option)

- $\left(\frac{\sqrt{3}}{2}, \frac{3}{2}, 0\right)$
- $\left(\sqrt{3}\cos\frac{\pi}{3}, \sqrt{3}\sin\frac{\pi}{3}, 0\right)$
- $\left(\sqrt{3}\sin\frac{\pi}{3}, \frac{\pi}{2}, \sqrt{3}\cos\frac{\pi}{3}\right)$ (selected)
- $\left(\sqrt{3}, \frac{\pi}{3}, 0\right)$

MTH301 Calculus II

Question No : 6 of 26 Marks: 1 (Budgeted Time 1 Min)

Suppose $f(x, y) = xy - 2y^2$ *where* $x = 3t + 1$ *and* $y = 2t$. Which one of the following is true?

Answer (Please select your correct option)

- $\frac{df}{dt} = -4t + 2$ (selected)
- $\frac{df}{dt} = -16t - t$
- $\frac{df}{dt} = 18t + 2$
- $\frac{df}{dt} = -10t^2 + 8t + 1$

MTH301 Calculus II

Question No : 7 of 26 Marks: 1 (Budgeted Time 1 Min)

Let w = f(x, y, z) and x = g(r, s), y = h(r, s), z = t(r, s) then by chain rule

$\frac{\partial w}{\partial r}$ =

Answer (Please select your correct option)

- $\frac{\partial w}{\partial x}\frac{\partial x}{\partial r}+\frac{\partial w}{\partial y}\frac{\partial y}{\partial r}+\frac{\partial w}{\partial z}\frac{\partial z}{\partial r}$
- $\frac{\partial w}{\partial r}\frac{\partial x}{\partial r}+\frac{\partial w}{\partial r}\frac{\partial y}{\partial r}+\frac{\partial w}{\partial r}\frac{\partial z}{\partial r}$
- $\frac{\partial w}{\partial x}\frac{\partial x}{\partial r}\frac{\partial x}{\partial s}+\frac{\partial w}{\partial y}\frac{\partial y}{\partial r}\frac{\partial y}{\partial s}+\frac{\partial w}{\partial z}\frac{\partial z}{\partial r}\frac{\partial z}{\partial s}$ (selected)
- $\frac{\partial w}{\partial r}\frac{\partial r}{\partial x}+\frac{\partial w}{\partial r}\frac{\partial r}{\partial y}+\frac{\partial w}{\partial r}\frac{\partial r}{\partial z}$

MTH301 Calculus II

Question No : 8 of 26 Marks: 1 (Budgeted Time 1 Min)

Magnitude of vector $\vec{a}$ is 2, magnitude of vector $\vec{b}$ is 3 and angle between them when placed tail to tail is 45 degrees. What is $\vec{a}\cdot\vec{b}$?

Answer (Please select your correct option)

- 4.5
- 6.2 (selected)
- 5.1
- 4.2

Question No : 9 of 26 Marks: 1 (Budgeted Time 1 Min)

Is the function $f(x, y)$ continuous at origin? If not, why?

$$f(x, y) = \begin{cases} 0 & \text{If } x \geq 0 \text{ and } y \geq 0 \\ 1 & \text{Otherwise} \end{cases}$$

Answer (Please select your correct option)

- ○ $f(x, y)$ is continuous at origin
- ◉ $f(0, 0)$ is not defined
- ○ $f(0, 0)$ is defined but $\lim_{(x,y)\to(0,0)} f(x, y)$ does not exist
- ○ $f(0, 0)$ is defined and $\lim_{(x,y)\to(0,0)} f(x, y)$ exists but these two numbers are not equal.

Question No : 10 of 26 Marks: 1 (Budgeted Time 1 Min)

Is the function $f(x, y)$ continuous at origin? If not, why?

$$f(x, y) = \begin{cases} \dfrac{3x^2 y}{x^2 + y^2} & \text{if } (x, y) \neq 0 \\ 0 & \text{if } (x, y) = 0 \end{cases}$$

Answer (Please select your correct option)

- ○ $f(x, y)$ is continuous at origin
- ◉ $f(0, 0)$ is not defined
- ○ $f(0, 0)$ is defined but $\lim_{(x,y)\to(0,0)} f(x, y)$ does not exist
- ○ $f(0, 0)$ is defined and $\lim_{(x,y)\to(0,0)} f(x, y)$ exists but these two numbers are not equal.

MTH301 Calculus II

Question No : 11 of 26 Marks: 1 (Budgeted Time 1 Min)

Let R be a closed region in two dimensional space. What does the double integral over R calculates?

Answer (Please select your correct option)

- Area of R.
- Radius of inscribed circle in R.
- Distance between two endpoints of R.
- None of these

MTH301 Calculus II

Question No : 12 of 26 Marks: 1 (Budgeted Time 1 Min)

Which of the following formula can be used to find the Volume of a parallelepiped with adjacent edges formed by the vectors $\bar{a}$, $\bar{b}$ and $\bar{c}$?

Answer (Please select your correct option)

- $\left|\bar{a} \times \left(\bar{b} \times \bar{c}\right)\right|$
- $\left|\bar{a} \bullet \left(\bar{b} \bullet \bar{c}\right)\right|$
- $\left|\bar{a} \bullet \left(\bar{b} \times \bar{c}\right)\right|$
- $\left|\bar{a} \times \left(\bar{b} \bullet \bar{c}\right)\right|$

MTH301 Calculus II

Question No : 13 of 26 Marks: 1 (Budgeted Time 1 Min)

Two surfaces are said to be orthogonal at a point of their intersection if their normals at that point are ---------

Answer (Please select your correct option)

- Parallel
- Perpendicular
- In opposite direction

MTH301 Calculus II

Question No : 14 of 26 Marks: 1 (Budgeted Time 1 Min)

By Extreme Value Theorem, if a function $f(x, y)$ is continuous on a closed and bounded set R, then $f(x, y)$ has both ---------------- on R.

Answer (Please select your correct option)

- Absolute maximum and absolute minimum value
- Relative maximum and relative minimum value

MTH301 Calculus II

Question No : 15 of 26 Marks: 1 (Budgeted Time 1 Min)

Let the function $f(x, y)$ has continuous second-order partial derivatives $(f_{xx}, f_{yy} \text{ and } f_{xy})$ in some circle centered at a critical point (x_0, y_0) and let $D = f_{xx}(x_0, y_0) f_{yy}(x_0, y_0) - f_{xy}^2(x_0, y_0)$

If $D > 0$ and $f_{xx}(x_0, y_0) < 0$ then f has ---------------

Answer (Please select your correct option)

- (selected) Relative maximum at (x_0, y_0)
- Relative minimum at (x_0, y_0)
- Saddle point at (x_0, y_0)
- No conclusion can be drawn.

MTH301 Calculus II

Question No : 16 of 26 Marks: 1 (Budgeted Time 1 Min)

Let the function $f(x, y)$ has continuous second-order partial derivatives $(f_{xx}, f_{yy} \text{ and } f_{xy})$ in some circle centered at a critical point (x_0, y_0) and let $D = f_{xx}(x_0, y_0) f_{yy}(x_0, y_0) - f_{xy}^2(x_0, y_0)$

If $D = 0$ then ---------------

Answer (Please select your correct option)

- (selected) f has relative maximum at (x_0, y_0)
- f has relative minimum at (x_0, y_0)
- f has saddle point at (x_0, y_0)
- No conclusion can be drawn.

MTH301 Calculus II

Question No : 17 of 26 Marks: 1 (Budgeted Time 1 Min)

If $R = R_1 \cup R_2$, where R_1 and R_2 are no overlapping regions then

$\iint_{R_1} f(x,y)dA + \iint_{R_2} f(x,y)dA =$

Answer (Please select your correct option)

- $\iint_{R} f(x,y)dA$
- $\iint_{R_1} f(x,y)dA \cup \iint_{R_2} f(x,y)dA$
- $\iint_{R} f(x,y)dV$
- $\iint_{R_1} f(x,y)dA \cap \iint_{R_2} f(x,y)dA$

MTH301 Calculus II

Question No : 18 of 26 Marks: 1 (Budgeted Time 1 Min)

$If\ R = \{(x,y)/\, 0 \le x \le 2\ and\ 1 \le y \le 4\}, then$

$\iint_{R} (6x^2 + 4xy^3)dA =$

Answer (Please select your correct option)

- $\int_1^4 \int_0^2 (6x^2 + 4xy^3)dydx$
- $\int_0^2 \int_1^4 (6x^2 + 4xy^3)dxdy$
- $\int_1^4 \int_0^2 (6x^2 + 4xy^3)dxdy$
- $\int_2^4 \int_0^1 (6x^2 + 4xy^3)dxdy$

MTH301 Calculus II

Question No : 19 of 26 Marks: 1 (Budgeted Time 1 Min)

If $R = \{(x,y) / 2 \le x \le 4 \; and \; 0 \le y \le 1\}$, then

$\iint_R (4xe^{2y}) dA =$

Answer (Please select your correct option)

- $\int_0^1 \int_2^4 (4xe^{2y}) dydx$
- $\int_0^1 \int_2^4 (4xe^{2y}) dxdy$ (selected)
- $\int_1^4 \int_0^2 (4xe^{2y}) dxdy$
- $\int_1^4 \int_0^2 (4xe^{2y}) dydx$

MTH301 Calculus II

Question No : 20 of 26 Marks: 1 (Budgeted Time 1 Min)

If $R = \{(x,y) / 0 \le x \le 4 \; and \; 0 \le y \le 9\}$, then

$\iint_R (3x - 4x\sqrt{xy}) dA =$

Answer (Please select your correct option)

- $\int_0^9 \int_0^4 (3x - 4x\sqrt{xy}) dydx$
- $\int_0^4 \int_4^9 (3x - 4x\sqrt{xy}) dxdy$
- $\int_4^9 \int_0^0 (3x - 4x\sqrt{xy}) dxdy$
- $\int_0^4 \int_0^9 (3x - 4x\sqrt{xy}) dydx$ (selected)

MTH301 Calculus II

Question No : 21 of 26 Marks: 2 (Budgeted Time 4 Min)

Suppose that the surface $f(x, y, z)$ has continuous partial derivatives at the point (a, b, c). Write down the equation of tangent plane at this point.

Answer (Please click here to Add Answer)

MTH301 Calculus II

Question No : 22 of 26 Marks: 2 (Budgeted Time 4 Min)

Evaluate the following double integral.

$\iint (12xy^2 - 8x^3)\, dy\, dx$

MTH301 Calculus II

Question No : 23 of 26 Marks: 3 (Budgeted Time 6 Min)

Evaluate the following double integral.

$\iint (3 + 2x - 3y^2)\, dx\, dy$

Answer (Please click here to Edit Answer)

MTH301 Calculus II

Question No : 24 of 26 Marks: 3 (Budgeted Time 6 Min)

Let $f(x, y, z) = xy^2e^z$

Find the gradient of f.

Answer (Please click here to Add Answer)

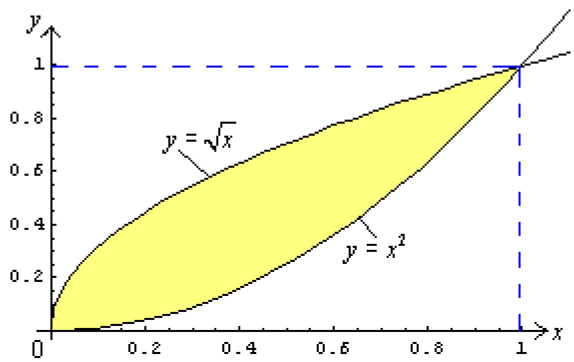
MTH301 Calculus II

Question No : 25 of 26 — Marks: 5 (Budgeted Time 10 Min)

Find, Equation of Tangent plane to the surface $f(x, y, z) = x^2 + y^2 + z - 9$ at the point $(1, 2, 4)$

Answer (Please click here to Add Answer)

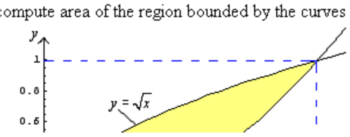
Use double integral in rectangular co-ordinates to compute area of the region bounded by the curves $y = x^2$ and $y = \sqrt{x}$.



MTH301 Calculus II

Question No : 26 of 26 — Marks: 5 (Budgeted Time 10 Min)

Use double integral in rectangular co-ordinates to compute area of the region bounded by the curves $y = x^2$ and $y = \sqrt{x}$.



Answer (Please click here to Add Answer)

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