

Question # 1 of 10 (Start time: 10:57:12 AM, 11 May 2024)

Let f be a function of two variables with continuous 2nd ordered partial derivatives in some circle centered at a critical point (x_0, y_0) and let $D = f_{xx}(x_0, y_0)f_{yy}(x_0, y_0) - f_{xy}^2(x_0, y_0)$.

Select the correct option

☐	$\text{if } D < 0 \text{ and } f_{xx}(x_0, y_0) > 0$, then f has a relative maximum at (x_0, y_0) .
☐	$\text{if } D > 0 \text{ and } f_{xx}(x_0, y_0) < 0$, then f has a relative minimum at (x_0, y_0) .
☐	$\text{if } D > 0 \text{ and } f_{xx}(x_0, y_0) > 0$, then f has a relative maximum at (x_0, y_0) .
☐	$\text{if } D = 0$, then no conclusion can be drawn.

Question # 2 of 10 (Start time: 10:58:44 AM, 11 May 2024)

 $y = \sqrt{9 - x^2}, -3 \leq x \leq 3$, is a _____ form of a curve in the plane.

Select the correct option

☐	parametric
☐	/ explicit
☐	implicit
☐	parametric vector

Click to S

Question # 3 of 10 (Start time: 11:00:18 AM, 11 May 2024)

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

Select the correct option



☐	parallel
☒	orthogonal
☐	different
☐	None of these

Question # 4 of 10 (Start time: 11:01:41 AM, 11 May 2024)

The surface: $z=f(x,y)$ neither falls nor rises (decreases or increases) at any point in the ----- of Gradient(z).

Select the correct option

- | | |
|----------------------------------|----------------------------|
| ☐ | Opposite to the direction |
| ☐ | Direction |
| ☒ | Direction perpendicular to |
| ☐ | Arbitrary direction |

Question # 5 of 10 (Start time: 11:02:22 AM, 11 May 2024)

If f is a function of x and y then the gradient of f is defined as

Select the correct option

☐	$\nabla f(x, y) = f_y(x, y)i + f_x(x, y)j$
☐	$\nabla f(x, y) = f_x(x, y)i + f_y(x, y)j$
☐	$\nabla f(x, y) = f_x(x, y)i - f_y(x, y)j$
☒	$\nabla f(x, y) = f_x(x, y)j + f_y(x, y)i$

Question # 10 of 10 (Start time: 11:07:29 AM, 11 May 2024)

In the following equation of plane

$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0$$

x_0, y_0 and z_0 are the coordinates of

Select the correct option

- | | |
|-----------------------|---------------------------------------|
| ☐ | the vector parallel to the plane |
| ☐ | the point on the plane |
| ☐ | None of these |
| ☐ | the vector perpendicular to the plane |

Question # 9 of 10 (Start time: 11:06:37 AM, 11 May 2024)

If the velocity components of a bicycle are 3m/s towards east and 4m/s towards north then the speed(magnitude of velocity) is -----m/s.



Select the correct option

☐	12
☐	7
☒	5
☐	1

Question # 6 of 10 (Start time: 11:03:54 AM, 11 May 2024)

Let $P_0(x_0, y_0, z_0)$ be any point on the surface $f(x, y, z) = 0$, if $f(x, y, z)$ is differentiable at $P_0(x_0, y_0, z_0)$ then the normal line at $P_0(x_0, y_0, z_0)$ has the equation

Select the correct option

☐	$x = x_0 + f_x(x_0)t, y = y_0 + f_y(y_0)t \text{ and } z = z_0 + f_z(z_0)t$
☐	$x = x_0 + f_x(P_0)t, y = y_0 + f_y(P_0)t \text{ and } z = z_0 + f_z(P_0)t$
☐	$x = x_0 + f_x(P_0)x, y = y_0 + f_y(P_0)y \text{ and } z = z_0 + f_z(P_0)z$
☐	$x = x_0 + f_x(P_0)t, y = y_0 + f_z(P_0)t \text{ and } z = z_0 + f_y(P_0)t$

Question # 7 of 10 (Start time: 11:05:37 AM, 11 May 2024)

The directional derivative of a function $f(x, y)$ in the direction of $\vec{u}$ can be written as

Select the correct option

☐	$\hat{u} \times \nabla f(x, y)$
☐	$\nabla f(x, y) \cdot u$
☐	$\nabla f(x, y) \cdot \hat{u}$
☐	$\nabla f(x, y) \times \hat{u}$

Question # 8 of 10 (Start time: 11:06:13 AM, 11 May 2024)

A ----- need not be the highest point on the entire graph.

Select the correct option

☐

relative minimum

☐

relative maximum

☐

absolute minimum

☐

absolute maximum

Question # 10 of 10 (Start time: 10:08:11 PM, 11 May 2024)

Which of the following statements about the normal line to a surface $z = f(x, y)$ at a point (x_0, y_0, z_0) is true?

Select the correct option

☐	The normal line is tangent to the curve of intersection of the surface with the $xy - plane$
☐	The normal line is parallel to the $xy - plane$
☐	The normal line lies in the $xy - plane$
☒	The normal line intersects the tangent plane to the surface at the point (x_0, y_0, z_0)

MTH301 - Calculus II (Quiz No.1)

Question # 1 of 10 (Start time: 09:58:48 PM, 11 May 2024)

If $f''(x) > 0 \ \forall x \in I$, then the graph of f _____ on I .

Select the correct option

☒	concave upward
☐	constant
☐	None of these
☐	concave downward

Question # 10 of 10 (Start time: 07:25:42 PM, 11 May 2024)

To

Let f be a function of two variables at a critical point $(1, 0)$, $f_{xx}(1, 0) = 4$, $f_{yy}(1, 0) = 2$ and $f_{xy}(1, 0) = 0$
so $D = f_{xx}(1, 0)f_{yy}(1, 0) - f_{xy}^2(1, 0) = 8$

Select the correct option



Reload Math



then no conclusion can be drawn.

then f has a relative maximum at $(1, 0)$.then f has a relative maximum at $(1, 0)$.then f has a relative minimum at $(1, 0)$.

Question # 3 of 10 (start time: 07:18:37 PM, 11 May 2024)

Total Ma

The differential of a function $y = f(x)$ is defined as _____

Select the correct option



Reload Math Equation



$$dy = f(x)$$



$$dy = f(x) dx dy$$



$$dy = f(x) dx$$



$$dy = f(x) dy$$

Vector products of two non-zero vectors lying in xy -plane results into ---

the result is always a vector that is perpendicular to the both of the original vectors..



In the equation $y=3x+2$, what is the y-intercept?

2..... 

-2

3

0

If $f(x, y)$ is continuous on a closed and bounded set R , then f has ___ on it.

Absolute minimum

Relative minimum

Absolute maximum

Both a and c.. 

Gradient of a scalar function always results in a ___ function.

Scalar

Vector.. 

Continuous

Discontinuous

We check the nature of each point.

$$f_{xx}(1,0) = 4,$$

$$f_{yy}(1,0) = 2,$$

$$f_{xy}(1,0) = 0$$

$$D = f_{xx}(1,0) \cdot f_{yy}(1,0) - [f_{xy}(1,0)]^2 \\ = 8 > 0$$

and $f_{xx}(1,0)$ is positive. Thus f has a relative minimum at $(1,0)$.

$$f_{xx}(0,-2) = 4,$$

$$f_{yy}(0,-2) = 0,$$

$$f_{xy}(0,-2) = -4$$

$$D = f_{xx}(0,-2) \cdot f_{yy}(0,-2) - [f_{xy}(0,-2)]^2 \\ = -16 < 0.$$

$$f_{xx}(0,2) = 4,$$

$$f_{yy}(0,2) = 0,$$

$$f_{xy}(0,2) = 4$$

$$D = f_{xx}(0,2) \cdot f_{yy}(0,2) - [f_{xy}(0,2)]^2 \\ = -16 < 0.$$

Therefore, f has a saddle point at $(0,2)$.

Therefore, f has a saddle point at $(0,-2)$.

$f(0,0)$ does not exist. The function f has a relative minimum at the critical point $(0,0)$.

The Second Partial Derivative Test

Let f be a function of two variables with continuous second order partial derivatives in some circle centered at a critical point (x_0, y_0) , and let

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

- (a) If $D > 0$ and $f_{xx}(x_0, y_0) > 0$, then f has a **relative minimum** at (x_0, y_0) .
- (b) If $D > 0$ and $f_{xx}(x_0, y_0) < 0$, then f has a **relative maximum** at (x_0, y_0) .
- (c) If $D < 0$, then f has a **saddle point** at (x_0, y_0) .
- (d) If $D = 0$, then no conclusion can be drawn.

REMARKS

If a function f of two variables has an absolute extremum (either an absolute maximum or an absolute minimum) at an interior point of its domain, then this extremum occurs at a critical point.

$$\begin{aligned} (x,y) \rightarrow (0,0) \quad x^2 + y^2 \\ = 1 = f(0,0) \end{aligned}$$

This shows that f is continuous at $(0,0)$

CONTINUITY OF FUNCTION OF THREE VARIABLES

A function f of three variables is called *continuous at a point* (x_0, y_0, z_0) if

1. $f(x_0, y_0, z_0)$ if defined.
2. $\lim_{(x,y,z) \rightarrow (x_0,y_0,z_0)} f(x, y, z)$ exists;
3. $\lim_{(x,y,z) \rightarrow (x_0,y_0,z_0)} f(x, y, z) = f(x_0, y_0, z_0)$.

Pg# 29, 34

EXAMPLE

Check the continuity of the function

$$f(x, y, z) = \frac{y+1}{x^2 + y^2 - 1}$$

Solution: