

1. Tangent Planes

- Matthew Jackson

1. Find an equation of the tangent plane to the given surface $z = y \cos(x-y)$ at $(1,4,0)$
2. Find an equation of the tangent plane to the given surface $z = \sqrt{xy}$ at $(7,7,7)$

- Claire Paulino

1. Find the equation of the plane tangent to $f(x,y) = \ln(x+y^2)$ at the point $(1,0,1)$
2. Find the equation of the plane tangent to $x^2 + 3y^2 + z^2 = 9$ at the point $(2,2,2)$

2. Directional Derivatives for Optimizations

-Nick Burns

1. Find the directional derivative of $f(x,y) = e^{xy} + 3x^2y$ at $(0,2)$ in the direction of $\mathbf{v} = \langle \cos(\pi/3), \sin(\pi/3) \rangle$
2. Given the function $f(x,y,z) = 5 + x^2 - 2y^2 + 3xy$, which directional derivative $D_{\mathbf{v}}f(1,1,1)$ is the largest?

- Connor Wells

1. Find the derivative of the function at P_0 in the direction of \mathbf{u} .
 1. $f(x,y) = 2xy - 3y^2$, $P_0(5,5)$ $\mathbf{u} = 4\mathbf{i} + 3\mathbf{j}$
 2. $f(x,y) = x^2 + 2y^2 - 3z^2$, $P_0(1,1,1)$ $\mathbf{u} = \mathbf{i} + \mathbf{j} + \mathbf{k}$

3. Finding Critical Points

-Jack Cooper

1. Find all the critical points of the function
 $f(x,y) = x^2 + xy + y^2 + 2x - 2y + 6$
2. Find the critical point of the function with the given domain:
 $7x^2 + 9y^2$ on the closed triangular plate bounded by the lines $x=0$, $y=0$, and $y+3x=3$

4. Classify Local max/local min/saddle points using Hessian

-Luke Sowell

1. In the given function find all of the local maxima, local minima and the Saddle points.

$$f(x,y) = 7e^{-y}(x^2+y^2) + 8$$

2. Find all of the local maxima, minima, and the saddle points of the function:
 $f(x,y) = 11 - 9\sqrt{x^2+y^2}$

5. Global/Absolute Extrema

-Jada Albertson

1. In the following problems: (1). Sketch the domain/find parametric equations of borders and (2) solve for Global Extrema

- 1. Find Absolute Max and Min of $f(x,y) = 10x + 30y - x^2 - y^2 + 21$ over the domain $D = \{(x,y) \rightarrow \mathbb{R} : 0 < x < 7, 0 < y < 22\}$ (*less than or equal to and greater than or equal to above)

- 2. Find Absolute Max and Min of $f(x,y) = 30x + 6y - x^2 - y^2 + 5$ on the disk centered at $(0,0)$ with radius 25

-Blake Martin

1. In the following problems: (1):Sketch the domain/find parametric equations of borders and (2) solve for Global Extrema

- 1. Find Absolute Max and Min of $f(x,y) = (8x - 2x^2)\cos y$ $D: \{ 1 < x < 3 \text{ and } \pi/4 < y < 3\pi/4 \}$ (*less than or equal to and greater than or equal to)
- 2. Find Absolute Max and Min of $f(x,y) = x^2 + xy + y^2 - 6x + 1$ $D: \{ 0 < x < 5 \text{ and } -3 < y < 0 \}$ (*less than or equal to and greater than or equal to)