

(local extremes)

1. Determine if the function $f(x, y) = 4xy - x^4 - y^4 - 11$ has local extremes at points $A_0 = [0; 0]$ or $A_1 = [1; 1]$. If the answer is YES, find its type and value.
2. Has the function $f(x, y) = e^x \cos y$ local extrema?
3. Find all critical points of the function $f(x, y) = y \cos x$.

Constrained extremes

4. Given $f(x, y) = 2xy - x^2 - 3y^2 + 4y$, identify the global extremes of f constrained on a line segment $y = 1 - x$ for $-1 \leq x \leq 1$.
5. Find global (constrained) extremes of function $f(x, y) = x^2 + y - x\sqrt{y} - 6x + 12$ on a line segment AB where $A = [0; 0]$ and $B = [9; 9]$.
6. Given $f(x, y) = 2x^2 + y^2 - xy + 3x + y + 1$,
 - a) Find local extremes of the function f , i.e. find their position, type and value.
 - b) Find (glob.) extremes of the function f constrained on the line $x = 2 - y$.
7. Find global extremes of $f(x, y) = x^2 - 2x + y^2$ on a set $\mathcal{H} = \{[x, y] \in \mathbb{R}^2; x^2 + y^2 = 9\}$.

Global (absolute) extremes

8. Find global extremes of $f(x, y) = x^2 + xy - 3x - y$ on a set $\mathcal{M} = \{[x, y] \in \mathbb{R}^2; x + y \leq 3 \wedge x \geq 0 \wedge y \geq 0\}$.
9. Find global extremes of $f(x, y) = 2x^2 - 4x + y^2 - 4y + 2$ on a set $\mathcal{M} = \{[x, y] \in \mathbb{R}^2; x \geq 0 \wedge 2 \geq y \geq 2x\}$.
10. Find global extremes of $f(x, y) = x^2 - y^2$ on a set $\mathcal{M} = \{[x, y] \in \mathbb{R}^2; x \geq -1 \wedge y \geq -1 \wedge x + 2y \leq 2\}$.