MATH 353   Handout #1

A

1. Find the boundary ∂S .Is the set S closed,open,bounded?

    (a) $S = \left\{ (x,y); \frac{|x|}{|y|} \leq 1 \right\}.$

    (b) $S = \{(x,y); y - 2x = 1, 1 \leq y \leq 3\}$

    (c) $S = \{\text{all irrational numbers between 0 and 1}\} \subset R$

2. Classify all critical points of the function $f(x,y) = xye^{-2x^2 - \frac{y^4}{4}}$.

B

3. Find the boundary ∂S .Is the set S closed,open,bounded?

    (a) $S = \{(x,y); \ln(xy) \leq 0\}.$

    (b) $S = \{(x,y); 0 < x^2 + y^2 < 4\}$

    (c) $S = \left\{ \frac{n}{3n+1} \right\}_{n=1}^{\infty} \subset R.$

4. Classify all critical points of the function $f(x,y) = 2xy^2 - x^2y + 4xy.$

C

5. Find the boundary ∂S .Is the set S closed,open,bounded?

    (a) $S = \left\{ (x,y); \frac{x^2}{y} \geq 1 \right\}$ .Sketch the set in the xy-plane.

    (b) $S = \{(x,y,z); x^2 + y^2 + 2z^2 = 4\}.$

    (a) Find all local extrema of the function $f(x,y) = xy(4 - x - 4y);$

    (b) Find the absolute max/min values of f on the triangle $\triangle\,ABC$
         with vertices $A\,(0,0)$, $B\,(0,1)$ and $C\,(1,0)$.

D

6. Sketch the set S . Find the boundary ∂S .Is the set S closed,open,bounded?

(a) $S = \left\{(x, y); y \leq \frac{1}{x}\right\}$

(b) $S = \left\{(x, y); 9 < \frac{1}{x^2 + y^2}\right\}$

$S = \{\sqrt[n]{n}\}_{n=1}^{\infty} \subset R$

7. Find all local extrema i.e.

Classify all critical points of the function $f(x, y) = 3y^3 - x^2 y + x^2$.