THE UNIVERSITY OF CALGARY
DEPARTMENT OF MATHEMATICS & STATISTICS
MATHEMATICS 353-02
QUIZ #1T

WINTER 2006
NAME: ________________________________ **I.D. No.**:___________

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1. Find ∂S - boundary of S. Is S closed? Open? Bounded? **Sketch** the set.
   (a) $S = (x, y) \mid \frac{x}{|y|} \leq 1\}$
   (b) $S = \{(x, y, z) \mid 2x^2 + 3y^2 + z^2 \leq 1, z \geq 0\}$ [5]
2. Find all local extrema of $f(x, y) = ye^{x^2-2y^2}$ in its domain.Explain. [5]

SOLUTION

for 1a)

it must $y \neq 0$ so the x -axis is out

snce $|y| > 0$ we can multiply and $x \leq |y|$

so all points above or on $y = x$, $y > 0$ are in

and for $y < 0$ $x \leq -y, -x \geq y$ below nad on the line

the set UNBDD

and the boundary is $\partial D = \{y = \pm x, x > 0\} \cup \{y = 0, x \leq 0\}$

first part is included ,the second excluded so **neither open nor closed..**

for b)

$2x^2 + 3y^2 + z^2 = 1$ is an ellipsoid, $z \geq 0$,means top half

the set is all points inside or on and above tr on the xy-plane

therefore the set BDD,and the boundary consists of two parts

bottom and shell

$\partial S = \{2x^2 + 3y^2 \leq 1, z = 0\} \cup \{2x^2 + 3y^2 + z^2 = 1, z \geq 0\}$

both are included so the set is **closed.**

For 2)

f is defined, continous,differentiable everywhere,for critical points solve

$f_x = 2xye^{x^2-2y^2} = 0$ so $x = 0$ or $y = 0$

$f_y = e^{x^2-2y^2}(1 - 4y^2) = 0$ so $y = \pm\frac{1}{2}$

we got 2 critical points $\left(0, \frac{1}{2}\right), \left(0, -\frac{1}{2}\right)$

for Second Derivative Test

$f_{xx} = 2ye^{x^2-2y^2}\left(1+2x^2\right)$ $\qquad f_{xy} = 2xe^{x^2-2y^2}\left(1-4y^2\right)$ $\qquad f_{yy} = e^{x^2-2y^2}\left(-12y+16y^3\right)$

Now

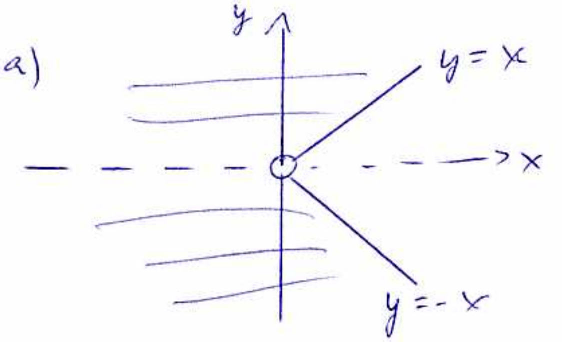
points	A	B	C	D	
$\left(0, \frac{1}{2}\right)$	$e^{-\frac{1}{2}}$	0	$-4e^{-\frac{1}{2}}$	pos	saddle
$\left(0, -\frac{1}{2}\right)$	$-e^{-\frac{1}{2}}$	0	$4e^{-\frac{1}{2}}$	pos	saddle

where $D = B^2 - AC$

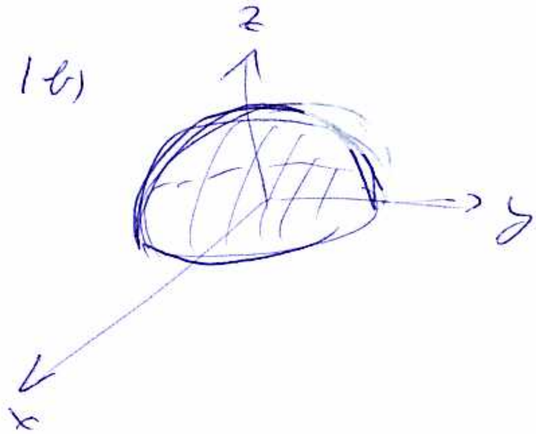
Quiz #1

T 04 Tue 10 am

1 a)

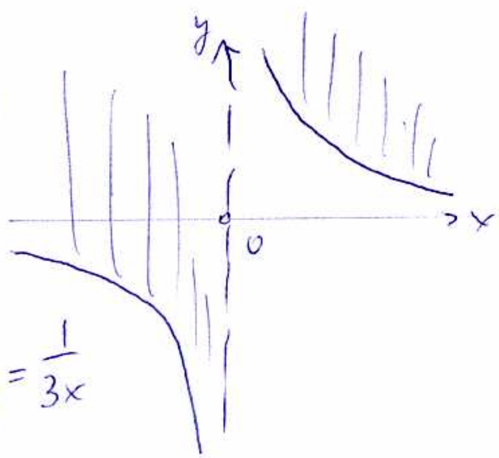


1 b)

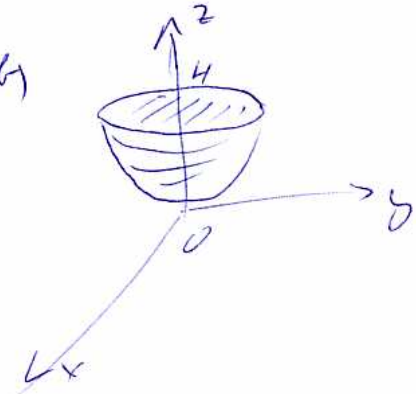


T 05 Tue 3 pm

1 a)

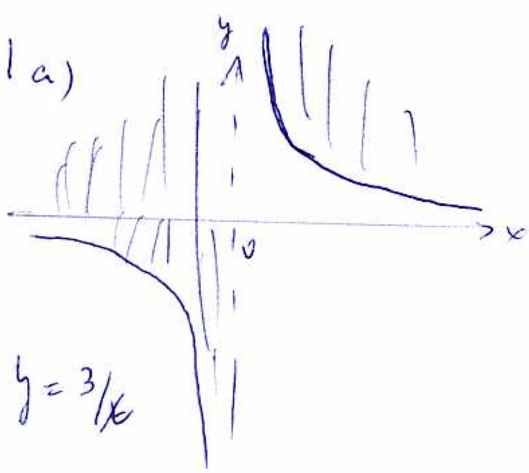


1 b)



T 01 + 02 Tue 2 pm

1 a)



1 b)