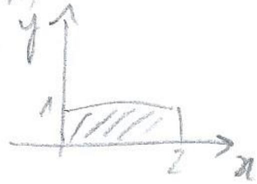
30) Det. o mín. e o máx. absolutos da função $f(x,y) = xe^y - x^2 - e^y$ na região rectangular $(0,0)$, $(0,1)$, $(2,0)$

$(2,1)$



1) No interior do domínio

$$\begin{cases} \frac{\partial f}{\partial x} = 0 \\ \frac{\partial f}{\partial y} = 0 \end{cases} \Rightarrow \begin{cases} e^y - 2x = 0 \\ xe^y - e^y = 0 \end{cases} \Leftrightarrow \begin{cases} e^y = 2x \\ x(2x) - 2x = 0 \end{cases}$$

$f(1, \ln 2) = e^{\ln 2} - 1 - e^{\ln 2} = -1$

$f(\frac{1}{2}, 0) = \frac{1}{2}$

$$\begin{cases} - \\ 2x(x-1) = 0 \end{cases} \Leftrightarrow \begin{cases} e^y = 0 \text{ imp } \vee e^y = 2 \\ x = 0 \vee x = 1 \end{cases} \Leftrightarrow \begin{cases} y = \ln 2 \\ x = 1 \end{cases} \quad (1, \ln 2)$$

$f(2,0) = 2 - 4 - 1 = -3 \rightarrow$ mínimo absoluto

$f(2,1) = e - 4 \approx 2{,}71 - 4 = -1{,}29$

$f(\frac{e}{2}, 1) = \frac{e}{2} e - \frac{e^2}{4} - e = \frac{e^2}{4} - \frac{4e}{4} \approx \frac{7{,}34 - 10{,}84}{4} \approx -0{,}87$

$f(0,0) = -1$

$f(0,1) = -e \approx -2{,}71$

2) fronteira do domínio

I) $y = 0 \quad 0 \leq x \leq 2$ $\quad G(x) = f(x,0) = x - x^2 - 1$

$G'(x) = 1 - 2x = 0 \quad x = \frac{1}{2}$

$f(\frac{1}{2}, 0) = \frac{1}{2} - \frac{1}{4} - 1 = \frac{2-1-4}{4} = \frac{-3}{4} = -0{,}75 \rightarrow$ máx. absoluto

II) $x = 2 \quad 0 \leq y \leq 1$ $\quad H(y) = f(2,y) = 2e^y - 4 - e^y = e^y - 4$

$(2,0)$ ou $(2,1)$

$H'(y) = e^y \neq 0$

III) $y = 1 \quad 0 \leq x \leq 2$ $\quad S(x) = f(x,1) = xe - x^2 - e = e(x-1) - x^2$

$(\frac{e}{2}, 1)$

$S'(x) = 0 \quad e - 2x = 0 \quad x = \frac{e}{2}$

IV) $x = 0 \quad 0 \leq y \leq 1$ $\quad K(y) = f(0,y) = -e^y \quad K'(y) = -e^y \neq 0$

$(0,0)$ e $(0,1)$