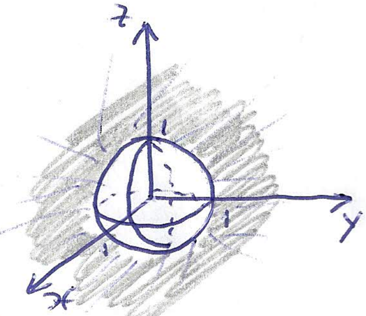
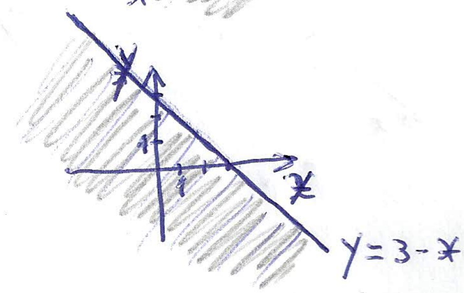
① a) $Df = \{(x,y,z) \in \mathbb{R}^3 : x^2+y^2+z^2 \geq 1\}$



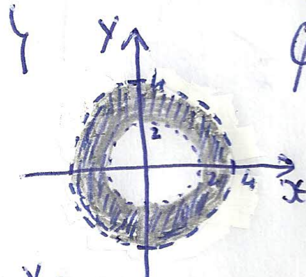
b) $Dg = \{(x,y) \in \mathbb{R}^2 : x+y \leq 3\}$



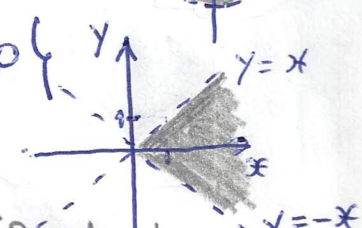
c) $D_i = \{(x,y) \in \mathbb{R}^2 : (16-x^2-y^2>0 \wedge x^2+y^2-4>0) \vee (16-x^2-y^2<0 \wedge x^2+y^2-4<0)\}$

$= \{(x,y) \in \mathbb{R}^2 : (x^2+y^2<16 \wedge x^2+y^2>4) \vee \underbrace{(x^2+y^2>16 \wedge x^2+y^2<4)}_{\emptyset}\}$

$= \{(x,y) \in \mathbb{R}^2 : x^2+y^2<16 \wedge x^2+y^2>4\}$

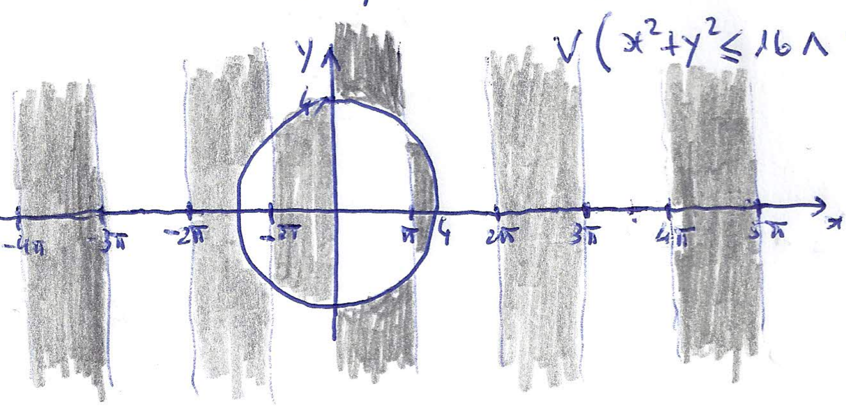


d) $D_b = \{(x,y) \in \mathbb{R}^2 : x+y>0 \wedge x-y>0\}$

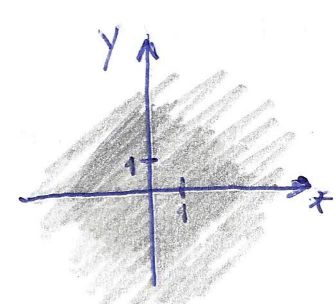


e) $D_h = \{(x,y) \in \mathbb{R}^2 : (x^2+y^2 \geq 16 \wedge \overbrace{2k\pi \leq x \leq \pi+2k\pi}^{1.º \text{ e } 2.º \text{ Quadrante}}) \vee$

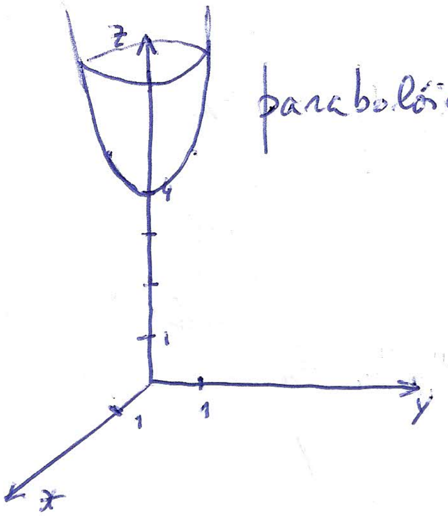
$\vee (x^2+y^2 \leq 16 \wedge \underbrace{\pi+2k\pi \leq x \leq 2(k+1)\pi}_{3.º \text{ e } 4.º \text{ Quadrante}}), k \in \mathbb{Z}\}$



f) $D_b = \{(x,y) \in \mathbb{R}^2\} = \mathbb{R}^2$

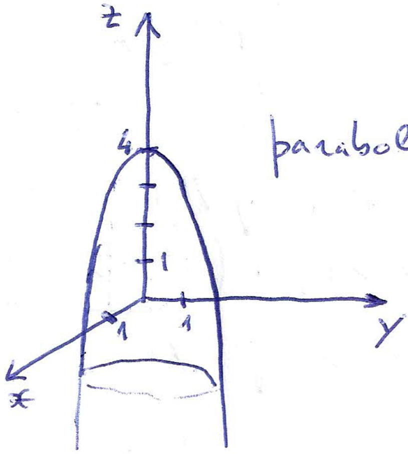


② a)



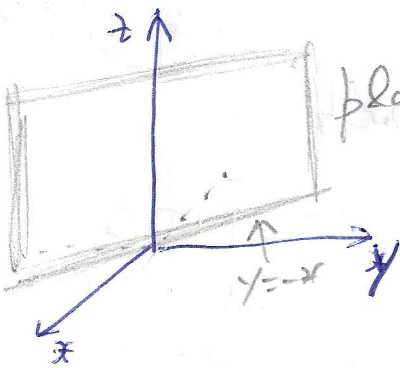
parabolóide

b)



parabolóide

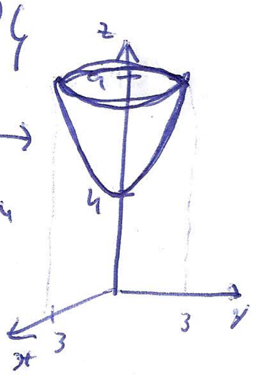
c)



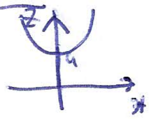
plano

③ a) $\underline{z=0} \Rightarrow \{\}$

$\underline{z=9} \longrightarrow$

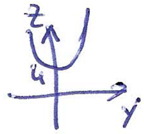


$\underline{y=0} \Rightarrow z = x^2+4$



$\underline{y=4} \Rightarrow z = x^2+8$

$\underline{x=0} \Rightarrow z = y^2+4$

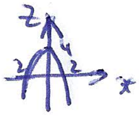


$\underline{x=2} \Rightarrow z = y^2+6$

b) $\underline{z=0} \Rightarrow x^2+y^2=4$

$\underline{z=9} \Rightarrow \{\}$

$\underline{y=0} \Rightarrow z = 4 - x^2$



$\underline{y=4} \Rightarrow z = -12 - x^2$

$\underline{x=0} \Rightarrow z = 4 - y^2$

$\underline{x=2} \Rightarrow z = -y^2$

c) $\underline{z=0} \Rightarrow y = -x$

$\underline{z=9} \Rightarrow y = 9 - x$

$y=0 \Rightarrow z = x$

$y=4 \Rightarrow z = x+4$

$x=0 \Rightarrow z = y$

$x=2 \Rightarrow z = 2+y$

④ a) 0 b) -3

⑤ a) $\lim_{x \to 0} \frac{x}{x+0} = \lim_{x \to 0} 1 = 1$

b) $\lim_{y \to 0} \frac{0}{0+y} = \lim_{y \to 0} 0 = 0$

c) Não existe limite $(1 \neq 0)$

6

a) Não existe limite

$\lim_{x\to0}\left(\lim_{y\to0} f(x,y)\right) \neq \lim_{y\to0}\left(\lim_{x\to0} f(x,y)\right)$ $\qquad 2 \neq -\frac{1}{3}$

b) Existe limite, e esse limite é $\frac{3}{8}$ $\qquad \boxed{\lim_{u\to0} \frac{e^u - 1}{u} = 1}$

c) Não existe limite $(1 \neq -1)$

7

a) $\left|\frac{3x^2y}{x^2+y^2}\right| \leq 3|y| \leq 3\sqrt{x^2+y^2} \implies 3\sqrt{x^2+y^2} < 3\delta \iff \delta = \frac{\varepsilon}{3}$

b) $\left|\frac{2x^2-3y^2}{\sqrt{x^2+y^2}}\right| \leq \left|\frac{3x^2+3y^2}{\sqrt{x^2+y^2}}\right| = \frac{3(x^2+y^2)}{\sqrt{x^2+y^2}} = 3\sqrt{x^2+y^2} \implies \delta = \frac{\varepsilon}{3}$