Resolução da Ficha N.º 2 - Geometria

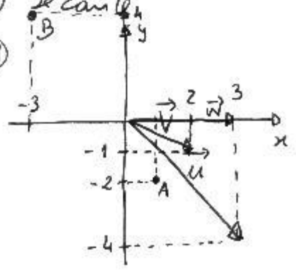
1

1.1 a) ABC e ABE
b) AB e DC
c) AB e ABC

d) IJ
e) AB e CK
f) $A(0,0,7)$ $B(0,4,7)$ $C(7,4,7)$ $D(7,0,7)$ $E(0,4,0)$
$F(9,4,0)$ $G(12,4,0)$ $H(12,0,0)$ $I(12,0,4)$ $J(12,4,4)$
$K(9,4,4)$ $L(9,0,4)$ $O(0,0,0)$

1.2 Secante

2.1



2.2 a) $\vec{u}+\vec{v} = (3,-4)+(2,-1) = (5,-5)$
b) $\vec{u}-\vec{v} = (3,-4)-(2,-1) = (1,-3)$
c) $A+2\vec{u} = (1,-2)+2(3,-4) = (7,-10)$
d) $\vec{AB}-\vec{w} = (-4,6)-(3,0) = (-7,6)$
$B-A = (-3,4)-(1,-2) = (-4,6)$
e) $2\vec{u}-3\vec{w} = 2(3,-4)-3(3,0) =$
$= (6,-8)-(9,0) = (-3,-8)$

2.3 a) $\|\vec{u}\| = \sqrt{3^2+(-4)^2} = \sqrt{25} = 5$
b) $\|\vec{AB}\| = \sqrt{(-4)^2+6^2} = \sqrt{16+36} = \sqrt{52}$
c) $3\vec{u} = 3(3,-4) = (9,-12)$ $\quad \|3\vec{u}\| = \sqrt{81+144} = \sqrt{225} = 15$
d) $\|\vec{u}+\vec{v}\| = \sqrt{5^2+(-5)^2} = \sqrt{25+25} = \sqrt{50}$

3 $\vec{AB} = (-4,-4)$ $\quad \vec{BC} = -2\vec{AB}$ logo $\vec{AB}$ e $\vec{BC}$ são colineares
$\vec{BC} = (8,8)$ $\qquad \vec{AB} \parallel \vec{BC}$

4 $\frac{1}{2} = \frac{K-1}{3} \Leftrightarrow 2K-2 = 3 \Leftrightarrow 2K = 5 \Leftrightarrow K = \frac{5}{2}$

5 $\sqrt{4+25} = \sqrt{9+(1+p)^2} \Leftrightarrow \sqrt{9+1+2p+p^2} = \sqrt{29} \Leftrightarrow 10+2p+p^2 = 29 \Leftrightarrow$
$\Leftrightarrow p^2+2p-19 = 0 \Leftrightarrow p = \frac{-2 \pm \sqrt{4+76}}{2} \Leftrightarrow p = \frac{-2 \pm \sqrt{80}}{2} \Leftrightarrow$
$\Leftrightarrow p = \frac{-2 \pm \sqrt{4 \times 20}}{2} \Leftrightarrow p = \frac{-2 \pm \sqrt{4} \times \sqrt{20}}{2} \Leftrightarrow p = \frac{-\cancel{2} \pm \cancel{2}\sqrt{20}}{\cancel{2}} \Leftrightarrow p = -1 \pm \sqrt{20}$

6 $\vec{u} = (-2,2)$
a) $\|\vec{u}\| = \sqrt{4+4} = \sqrt{8}$ $\quad$ versor de $\vec{u} = \left(\frac{-2}{\sqrt{8}}, \frac{2}{\sqrt{8}}\right)$
b) $\vec{x} \parallel \vec{u}$ $\quad \|\vec{x}\| = 10\sqrt{2}$
Se $\vec{x} \parallel \vec{u}$ então $\vec{x} = K(-2,2) \Leftrightarrow \vec{x} = (-2K, 2K)$
$\|\vec{x}\| = 10\sqrt{2} \Leftrightarrow \sqrt{4K^2+4K^2} = 10\sqrt{2} \Leftrightarrow (\sqrt{8K^2})^2 = (10\sqrt{2})^2 \Leftrightarrow 8K^2 = 200 \Leftrightarrow$
$\Leftrightarrow K^2 = 25 \Leftrightarrow K = \pm 5$. Conclusão: $\vec{x} = (-10, 10)$ ou $\vec{x} = (10, -10)$

(7) $\vec{u} \parallel (2,-3) \Rightarrow \vec{u} = (2k, -3k)$

$\|\vec{u}\| = 3 \Leftrightarrow \left(\sqrt{4k^2+9k^2}\right)^2 = 3^2 \Leftrightarrow 13k^2 = 9 \Leftrightarrow k^2 = \frac{9}{13} \Leftrightarrow$

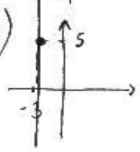
$\Leftrightarrow k = \pm \frac{3}{\sqrt{13}}$

Logo $\vec{u} = \left(\frac{6}{\sqrt{13}}, -\frac{9}{\sqrt{13}}\right)$ ou $\vec{u} = \left(-\frac{6}{\sqrt{13}}, \frac{9}{\sqrt{13}}\right)$

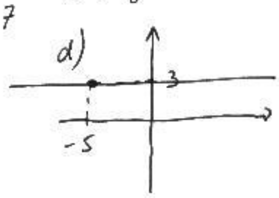
(8) a) $\frac{x-3}{2} = \frac{y+1}{1} \Leftrightarrow 2y + 2 = x - 3 \Leftrightarrow 2y = x - 5 \Leftrightarrow y = \frac{1}{2}x - \frac{5}{2}$

b) $A(1,2)$ $B(2,-5)$ $\vec{AB} = (1,-7)$

$\frac{x-1}{1} = \frac{y-2}{-7} \Leftrightarrow y - 2 = -7x + 7 \Leftrightarrow y = -7x + 9$

c) 

$x = -3$

d) 

$y = 3$

e) $A(7,-1)$ $\parallel (4,3)$

$\frac{x-7}{4} = \frac{y+1}{3} \Leftrightarrow 4y + 4 = 3x - 21 \Leftrightarrow 4y = 3x - 25 \Leftrightarrow y = \frac{3}{4}x - \frac{25}{4}$

f) $y = \frac{4}{3}x + b$

$(0,-2) \Rightarrow -2 = \frac{4}{3} \times 0 + b \Leftrightarrow b = -2$. Logo $y = \frac{4}{3}x - 2$

g) $y = 2x + b$

$(-3,6) \Rightarrow 6 = 2(-3) + b \Leftrightarrow 6 = -6 + b \Leftrightarrow b = 12$ Logo $y = 2x + 12$

h) $\begin{cases} x - 2 = 3k \\ y + 1 = -2k \end{cases} \Leftrightarrow \begin{cases} \frac{x-2}{3} = k \\ \frac{y+1}{-2} = k \end{cases} \Leftrightarrow \frac{x-2}{3} = \frac{y+1}{-2} \Leftrightarrow 3y + 3 = -2x + 4 \Leftrightarrow$

$\Leftrightarrow 3y = -2x + 1 \Leftrightarrow y = -\frac{2}{3}x + \frac{1}{3}$

i) $\frac{x+1}{2} = \frac{y-3}{3} \Leftrightarrow 2y - 6 = 3x + 3 \Leftrightarrow 2y = 3x + 9 \Leftrightarrow y = \frac{3}{2}x + \frac{9}{2}$

(9) a) $y = \frac{1}{2}x - \frac{5}{2}$

Se $x = 2 \Rightarrow y = 1 - \frac{5}{2} = -\frac{3}{2}$ Ponto $P(2, -\frac{3}{2})$

Vector director $\vec{u} = (2,1)$

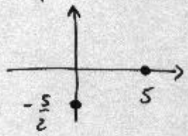
$(3,5)$ pertencerá? $5 = \frac{1}{2} \times 3 - \frac{5}{2} \Leftrightarrow 5 = -1$ Falso, logo $(3,5) \notin$ recta.

$\Rightarrow$ Restantes alíneas ... semelhante.

⑩ a) $y = \frac{1}{2}x - \frac{5}{2}$

Intersecção com xx : $y = 0 \rightarrow 0 = \frac{1}{2}x - \frac{5}{2} \Leftrightarrow x = 5$ P.I. $(5,0)$

Intersecção com yy : $x = 0 \rightarrow y = -\frac{5}{2}$ P.I. $\rightarrow \left(0, -\frac{5}{2}\right)$



→ Restantes alíneas ... semelhante.

⑪ $2x - 3y + 6 = 0$

a) $\vec{u} = (3,2)$

b) $2x - 3y + 6 = 0 \Leftrightarrow 3y = 2x + 6 \Leftrightarrow y = \frac{2}{3}x + 2$

abcissa na origem $= -3$ $(y=0)$

ordenada na origem $= 2$ $(x=0)$

declive $= m = \frac{2}{3}$

⑫

a) $(\times 2)\begin{cases} -2x + y = 1 \\ 4x + 3y = -5 \end{cases} \Leftrightarrow \begin{cases} -4x + 2y = 2 \\ 4x + 3y = -5 \end{cases} \Leftrightarrow \begin{cases} -2x + \left(-\frac{3}{5}\right) = 1 \\ y = -\frac{3}{5} \end{cases} \Leftrightarrow$

$5y = -3$

$y = -\frac{3}{5}$

$\Leftrightarrow \begin{cases} -2x - \frac{3}{5} = 1 \\ y = -\frac{3}{5} \end{cases} \Leftrightarrow \begin{cases} 2x = -\frac{3}{5} - 1 \\ \text{——} \end{cases} \Leftrightarrow \begin{cases} 2x = -\frac{8}{5} \\ \text{——} \end{cases} \begin{cases} x = -\frac{8}{10} \\ \text{——} \end{cases} \begin{cases} x = -\frac{4}{5} \\ y = -\frac{3}{5} \end{cases}$

→ Rectas concorrentes

b) $\begin{cases} x + y = 2 \\ x - y = 1 \end{cases} \Leftrightarrow \begin{cases} \frac{3}{2} + y = 2 \\ x = \frac{3}{2} \end{cases} \begin{cases} y = 2 - \frac{3}{2} \\ \text{——} \end{cases} \begin{cases} y = \frac{1}{2} \\ x = \frac{3}{2} \end{cases}$

$2x = 3$

$x = \frac{3}{2}$

→ Rectas concorrentes

c) $(-2)\begin{cases} 2x + y = 1 \\ 4x + 2y = 3 \end{cases} \begin{cases} -4x - 2y = -2 \\ 4x + 2y = 3 \end{cases}$

$0 + 0 = 1$

$0 = 1$ impossível

→ Rectas paralelas (estritamente)

d) $(3)\begin{cases} 2x - y = 4 \\ -6x + 3y = -12 \end{cases} \begin{cases} 6x - 3y = 12 \\ -6x + 3y = -12 \end{cases}$

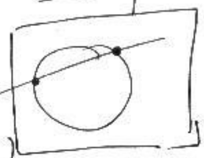
$0 + 0 = 0$ Sistema possível indeterminado

→ Rectas paralelas (coincidentes)

(13)

a) $\begin{cases} x^2+y^2=1 \\ y=x \end{cases} \Leftrightarrow \begin{cases} x^2+x^2=1 \\ \text{—} \end{cases} \begin{cases} 2x^2=1 \\ \text{—} \end{cases} \begin{cases} x^2=\frac{1}{2} \\ \text{—} \end{cases} \begin{cases} x=\pm\sqrt{\frac{1}{2}} \\ \text{—} \end{cases}$

$\begin{cases} x=\pm\frac{\sqrt{1}}{\sqrt{2}} \\ \text{—} \end{cases} \begin{cases} x=\pm\frac{1}{\sqrt{2}}\frac{(\sqrt{2})}{(\sqrt{2})} \\ \text{—} \end{cases} \begin{cases} x=\pm\frac{\sqrt{2}}{2} \\ \text{—} \end{cases}$



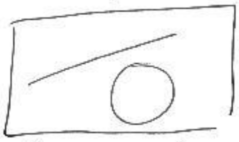
Se $x=\frac{\sqrt{2}}{2}$ então $y=\frac{\sqrt{2}}{2} \rightsquigarrow I_1\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

Se $x=-\frac{\sqrt{2}}{2}$ então $y=-\frac{\sqrt{2}}{2} \rightsquigarrow I_2\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

Recta secante à circunferência

b) $\begin{cases} x^2+y^2=1 \\ x+y=4 \end{cases} \Leftrightarrow \begin{cases} x^2+(4-x)^2=1 \\ y=4-x \end{cases} \begin{cases} x^2+16-8x+x^2=1 \\ \text{—} \end{cases} \begin{cases} 2x^2-8x+15=0 \\ \text{—} \end{cases}$

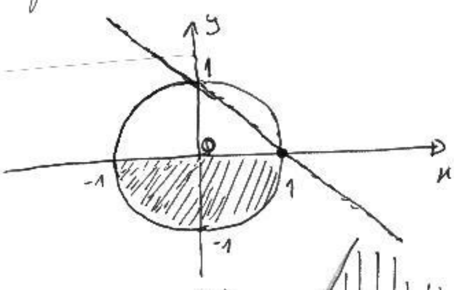
$\begin{cases} x=\frac{8\pm\sqrt{64-120}}{4} \\ \text{—} \end{cases}$ impo.



Não existe intersecção. Recta exterior à circunferência.

(14)

a) $\begin{cases} x^2+y^2\le 1 & \to C(0,0)\ r=1 \\ x+y\le 1 & \to y\le -x+1 \\ y\le 0 \end{cases}$

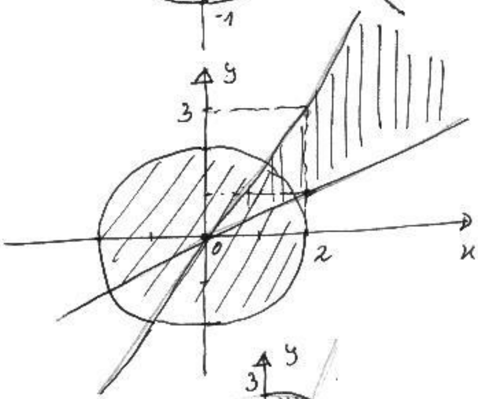


b) $x^2+y^2\le 4 \vee \left(y\ge \frac{1}{2}x \wedge y\le \frac{3}{2}x\right)$

$C(0,0)$
$r=2$

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

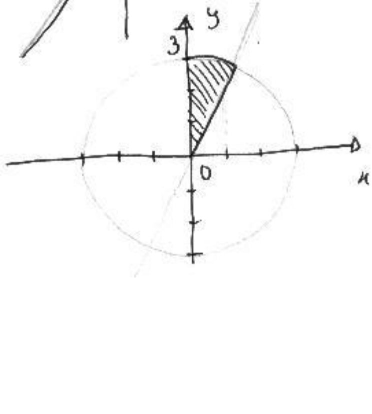
$(0,0)$
$(2,3)$



c) $x^2+y^2\le 9 \wedge x\ge 0 \wedge y\ge 2x$

$C(0,0)$
$r=3$

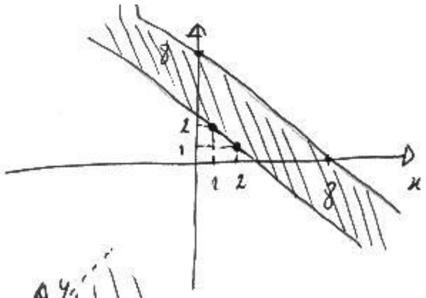
$(0,0)$
$(1,2)$



d) $y \geqslant -x+3 \wedge y \leqslant -x+8$

$(1,2)$ $\quad$ $(0,8)$

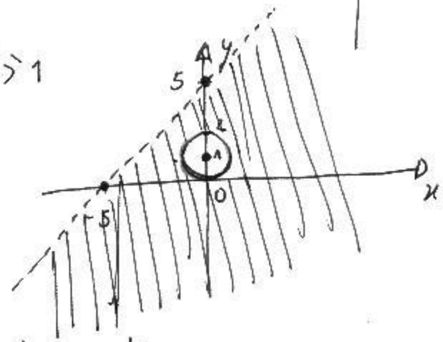
$(2,1)$ $\quad$ $(8,0)$



e) $y < x+5 \wedge x^2+(y-1)^2 \geqslant 1$

$(0,5)$ $\quad$ $C(0,1)$

$(-5,0)$ $\quad$ $r = 1$

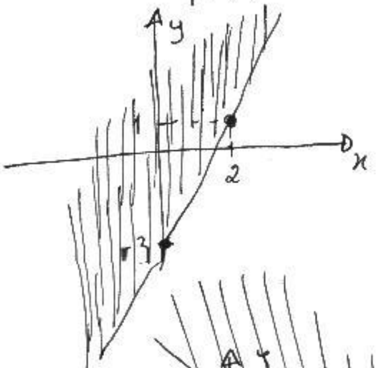


f) $2x - y \leqslant 3$

$\Leftrightarrow y \geqslant 2x - 3$

$(0,-3)$

$(2,1)$

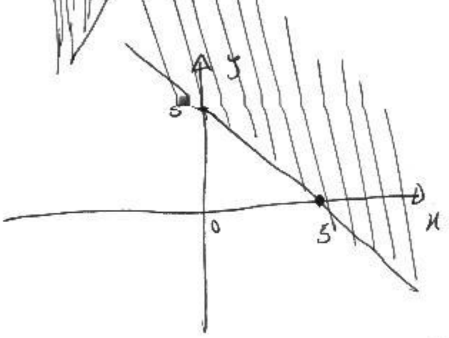


g) $x+y \geqslant 5$

$\Leftrightarrow y \geqslant -x+5$

$(0,5)$

$(5,0)$



15 A

$$\left(y \leqslant -\frac{1}{2}x \wedge y \geqslant \frac{1}{3}x\right) \vee (x-2)^2+y^2 \leqslant 4$$

C.A.: Recta $P(0,0)$ $Q(-2,1)$ $\overrightarrow{PQ} = (-2,1)$

$m = -\frac{1}{2}$

$y = -\frac{1}{2}x$

Recta $P(0,0)$ $Q(-3,-1)$ $\overrightarrow{PQ} = (-3,-1)$

$m = \frac{1}{3}$

$y = \frac{1}{3}x$

circunf.

$C(2,0)$ $r = 2$

(B) e.A:

Recta

$P(0,0)$ $Q(-2,1)$ $\vec{PQ} = (-2,1)$

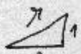
$m = -\frac{1}{2}$

$y = -\frac{1}{2}x$ $\rightarrow$ $x^2 + y^2 \leq 4 \wedge y \leq -\frac{1}{2}x \wedge x \leq 0$

circunf.

$C(0,0)$ $r = 2$

(C) e.A:

circunf. 

$r = \sqrt{5}$

$C(3,1)$ $r = \overset{2}{\sqrt{5}}$

Recta

$P(-2,0)$ $Q(0,1)$ $\vec{PQ}(2,1)$

$m = \frac{1}{2}$ $\rightarrow \left((x-3)^2 + (y-1)^2 \leq 5 \wedge y \geq \frac{1}{2}x+1\right) \vee \left((x-3)^2 + (y-1)^2 \leq 5 \wedge y \leq 0\right)$

$y = \frac{1}{2}x + 1$

ou $(x-3)^2 + (y-1)^2 \leq 5 \wedge \left(y \geq \frac{1}{2}x + 1 \vee y \leq 0\right)$

(D) e.A:

Recta

$P(2,-1)$ $Q(3,2)$ $\vec{PQ} = (1,3)$

$m = 3$

$y = 3x + b$ $\rightarrow \left(y \leq 3x - 7 \wedge y \leq -1\right) \vee \left(y \geq 3x - 7 \wedge y \geq -1 \wedge y \leq 2\right)$

$(3,2) \rightarrow 2 = 3 \times 3 + b$

$b = -7$ ou $\left(y \leq 3x - 7 \wedge y \leq -1\right) \vee \left(y \geq 3x - 7 \wedge -1 \leq y \leq 2\right)$

$y = 3x - 7$

(E) e.A:

Recta

$P(-2,-3)$ $Q(4,1)$ $\vec{PQ}(6,4)$

$m = \frac{4}{6} = \frac{2}{3}$

$y = \frac{2}{3}x + b$ $\rightarrow y \geq \frac{2}{3}x - \frac{5}{3} \wedge x \geq -2 \wedge y \leq 1$

$(4,1) \rightarrow 1 = \frac{2}{3} \times 4 + b$

$b = -\frac{5}{3}$

$y = \frac{2}{3}x - \frac{5}{3}$

(F)

c.A:

Recta

$P(-3,-1)\ Q(-2,0)\ \vec{PQ}=(1,1)$

$m=1$

$b=2 \rightarrow y=x+2$

$P(0,-1)\ Q(-3,1)\ \vec{PQ}=(-3,2)$

$m=-\frac{2}{3}$ $\longrightarrow y < x+2 \wedge y > -\frac{2}{3}x-1$

$b=-1 \rightarrow y=-\frac{2}{3}x-1$

(16) Seja $\mathcal{C}$ a circunf. de centro $(0,0)$ e raio r:

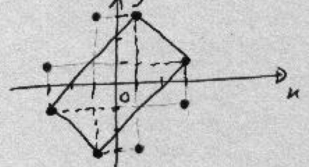
$\mathcal{C} \rightarrow x^2+y^2=r^2$

$(3,1)\ A \rightarrow 3^2+1^2=r^2 \Leftrightarrow r^2=10 \Leftrightarrow r=\sqrt{10}$

$(1,3)\ B \rightarrow 1^2+3^2=10=r^2$ ✓

$(-1,-3)\ C \rightarrow (-1)^2+(-3)^2=10=r^2$ ✓

$(-3,-1)\ D \rightarrow (-3)^2+(-1)^2=10=r^2$ ✓



$E(-1,3)$ $G(-3,1)$ Octógonos, etc...

$F(1,-3)$ $H(3,-1)$

(17)

a) $2x^2+y^2=3 \Leftrightarrow$

$\Leftrightarrow \frac{2x^2}{3}+\frac{y^2}{3}=1 \Leftrightarrow$

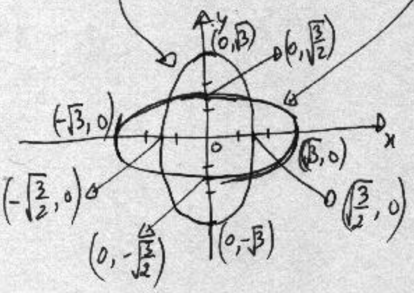
$\Leftrightarrow \frac{x^2}{\frac{3}{2}}+\frac{y^2}{3}=1$

$\begin{cases} a=\sqrt{\frac{3}{2}} \\ b=\sqrt{3} \end{cases}$

$x^2+2y^2=3 \Leftrightarrow$

$\Leftrightarrow \frac{x^2}{3}+\frac{2y^2}{3}=1 \Leftrightarrow$

$\Leftrightarrow \frac{x^2}{3}+\frac{y^2}{\frac{3}{2}}=1 \longrightarrow \begin{cases} a=\sqrt{3} \\ b=\sqrt{\frac{3}{2}} \end{cases}$



b) $\begin{cases} 2x^2+y^2=3 \\ x^2+2y^2=3 \end{cases}$ $\begin{cases} y^2=3-2x^2 \\ x^2+2(3-2x^2)=3 \end{cases}$

$\begin{cases} \overline{} \\ x^2+6-4x^2=3 \end{cases}$ $\begin{cases} \overline{} \\ -3x^2=-3 \end{cases}$ $\begin{cases} \overline{} \\ x^2=1 \end{cases}$ $\begin{cases} \overline{} \\ x=\pm 1 \end{cases}$

$x=1 \rightarrow y^2=3-2 \Leftrightarrow y^2=1 \Leftrightarrow y=\pm 1 \rightarrow (1,1),\ (1,-1)$

$x=-1 \rightarrow y^2=3-2 \Leftrightarrow y^2=1 \Leftrightarrow y=\pm 1 \rightarrow (-1,1),\ (-1,-1)$

$\longrightarrow$ 4 pontos de intersecção.

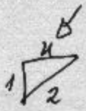
(18)

$C(0,0,0)$ $r=2$

a) Circunferência, um ponto ou o conjunto vazio.

b.1) Circunf. de centro $(0,0,0)$ e raio 2 sobre o plano yOz.

b.2) Circunf. de centro $(0,0,1)$ e raio $\sqrt{3}$ sobre o plano $y=1$.



$x^2+1^2=2^2$

$x=\sqrt{3}$

b.3) Não existe corte $(3>2)$

c) $z=2$; $z=-2$; $x=2$; $x=-2$; $y=2$; $y=-2$

(19)

a) $P(3,-3,0)$ $S(-3,-3,0)$ $R(3,-3,0)$

b) $V=108$

$V=\frac{1}{3}Ab\times h=\frac{1}{3}\times 36\times h=12h$

$12h=108 \Leftrightarrow h=\frac{108}{12}=9$, logo $V(0,0,9)$

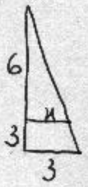
c) $P(3,-3,0)$

$Q(3,3,0)$ $\overrightarrow{QV}=(-3,-3,9)$

$V(0,0,9)$

$\rightarrow (x,y,z)=(3,-3,0)+k(-3,-3,9)$; $k\in\mathbb{R}$

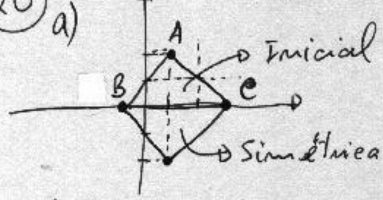
d)



$\frac{9}{6}=\frac{3}{x} \Leftrightarrow 9x=18 \Leftrightarrow x=2$

A secção é um quadrado de lado $2\times2=4$ logo Área $=16$.

(20) a)



d) Quanto aos lados: Isósceles

Quanto aos ângulos: Acutângulo

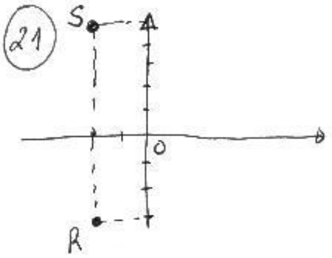
b) Não são colineares, pois não se encontram sobre uma recta.

e) Centro $(0,1)$ $r = \sqrt{2}$

$$x^2 + (y-1)^2 = 2$$

f) $x = 1$; $y = -x + 1$

21



a) $M(-2,1)$

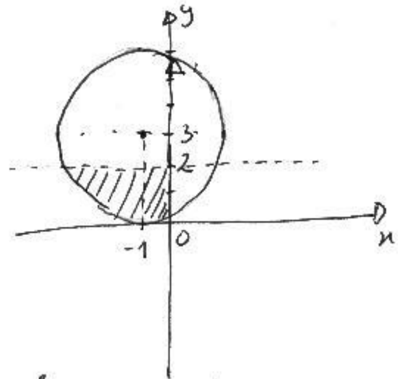
b) $y = 1$

c) $8 = \overline{RS}$

22 $(x+1)^2 + (y-3)^2 = 9$

a) $C(-1,3)$ $r = 3$

b) $(x+1)^2 + (y-3)^2 \leq 9 \wedge y < 2 \wedge x \leq 0$



23 a) $2x^2 + 2y^2 - 8x + 4y = 0 \Leftrightarrow$

$\Leftrightarrow x^2 + y^2 - 4x + 2y = 0$

$\Leftrightarrow x^2 - 4x + y^2 + 2y = 0$

$\Leftrightarrow (x-2)^2 + (y+1)^2 = 4 + 1$

$\Leftrightarrow (x-2)^2 + (y+1)^2 = 5$

$C(2,-1)$ $r = \sqrt{5}$

b) $x^2 + y^2 + 4x - 6y + 4 = 0$

$\Leftrightarrow x^2 + 4x + y^2 - 6y = -4$

$\Leftrightarrow (x+2)^2 + (y-3)^2 = -4 + 4 + 9$

$\Leftrightarrow (x+2)^2 + (y-3)^2 = 9$

$C(-2,3)$ $r = 3$

c) $x^2 + y^2 - 6x - 7 = 0$

$\Leftrightarrow x^2 - 6x + y^2 = 7$

$\Leftrightarrow (x-3)^2 + y^2 = 7 + 9$

$\Leftrightarrow (x-3)^2 + y^2 = 16$

$C(3,0)$ $r = 4$

d) $(x+3)^2 + y^2 = 8$

$C(-3,0)$ $r = \sqrt{8}$

e) $x^2 + x + y^2 + 2y + \frac{5}{4} = 0$

$\Leftrightarrow \left(x + \frac{1}{2}\right)^2 + (y+1)^2 = -\frac{5}{4} + \frac{1}{4} + 1$

$\Leftrightarrow \left(x + \frac{1}{2}\right)^2 + (y+1)^2 = 0$

Ponto $\left(-\frac{1}{2}, -1\right)$

f) $x^2+y^2+2x-y=\frac{23}{4}$

$\Leftrightarrow x^2+2x+y^2-y=\frac{23}{4}$

$\Leftrightarrow (x+1)^2+\left(y-\frac{1}{2}\right)^2=\frac{23}{4}+1+\frac{1}{4}$

$\Leftrightarrow (x+1)^2+\left(y-\frac{1}{2}\right)^2=7$

$C\left(-1,\frac{1}{2}\right)\quad r=\sqrt{7}$

24) $x^2+y^2+z^2-2x-4z\leq 4$

$\Leftrightarrow x^2-2x+y^2+z^2-4z\leq 4$

$\Leftrightarrow (x-1)^2+y^2+(z-2)^2\leq 4+1+4$

$\Leftrightarrow (x-1)^2+y^2+(z-2)^2\leq 9$

$C(1,0,2)\quad r=3$

25) $T(1,0,2)\qquad U(2,1,2)$

$(x-1)^2+y^2+(z-2)^2=(x-2)^2+(y-1)^2+(z-2)^2$

$\Leftrightarrow \cancel{x^2}-2x+\cancel{1}+\cancel{y^2}+\cancel{z^2}-\cancel{4z}+\cancel{4}=\cancel{x^2}-4x+4+\cancel{y^2}-2y+\cancel{1}+\cancel{z^2}-\cancel{4z}+\cancel{4}$

$\Leftrightarrow -2x=-4x+4-2y$

$\Leftrightarrow \boxed{2x+2y-4=0}$

26 $C(3,3,3)$ $\quad r = 3$

a) $(x-3)^2+(y-3)^2+(z-3)^2 \leq 9$

b) $x=6$; $y=6$; $z=6$

c) $d = \sqrt{3^2+3^2+3^2} = \sqrt{9+9+9} = \sqrt{27}$

d) $A(-3,3,3)$

e) Círculo.

$$(x-3)^2+(y-3)^2+(z-3)^2 \leq 9 \wedge x=4$$

$$\Leftrightarrow (4-3)^2+(y-3)^2+(z-3)^2 \leq 9 \wedge x=4$$

$$\Leftrightarrow (y-3)^2+(z-3)^2 \leq 8 \wedge x=4$$