$1 - 8x^2 + 17y^2 - 12xy - 20 = 0$

$8(x'\cos\theta - y'\,\text{sen}\,\theta)^2 + 17(x'\,\text{sen}\,\theta + y'\cos\theta)^2$
$-12(x'\cos\theta - y'\,\text{sen}\,\theta)(x'\,\text{sen}\,\theta + y'\cos\theta) - 20 = 0$

$8((x')^2\cos^2\theta - 2.x'y'\cos\theta\,\text{sen}\,\theta + (y')^2\,\text{sen}^2\theta)$
$+17((x')^2\,\text{sen}^2\theta + 2.x'y'\cos\theta\,\text{sen}\,\theta + (y')^2\cos^2\theta)$
$-12((x')^2\cos\theta.\text{sen}\,\theta + x'y'\cos^2\theta - x'y'\,\text{sen}^2\theta - (y')^2\cos\theta.\text{sen}\,\theta$

$(x'y')(-16\cos\theta.\text{sen}\,\theta + 34\cos.\text{sen}\,\theta - 12\cos^2\theta + 12\,\text{sen}^2\theta)$

$+18\cos\theta.\text{sen}\,\theta - 12\cos^2\theta + 12\,\text{sen}^2\theta = 0 \div 6\cos^2\theta$

$$3\frac{\text{sen}\,\theta}{\cos\theta} - 2 + 2\frac{\text{sen}^2\theta}{\cos^2\theta} = 0$$

$$u = tg = \frac{\text{sen}\,\theta}{\cos\theta}$$

$$3u - 2 + 2u^2 = 0$$

$\Delta = 9 - 4.(+2).(-2)$
$\Delta = 9 + 16$
$\Delta = 25$

$$u = \frac{-3 \pm 5}{4} = \begin{cases} -2 \\ \frac{1}{2} \end{cases}$$

$$\frac{\text{sen}\,\theta}{\cos\theta} = \frac{1}{2}$$

$$\begin{cases} \cos\theta = 2\,\text{sen}\,\theta \\ \text{sen}^2\theta + \cos^2\theta = 1 \end{cases}$$

$\text{sen}^2\theta + (2\,\text{sen}\,\theta)^2 = 1$
$\text{sen}^2\theta + 4\,\text{sen}^2\theta = 1$
$\text{sen}^2\theta = \frac{1}{5}$

$$\text{sen}\,\theta = \frac{1}{\sqrt{5}}\cdot\frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{5}$$

$\frac{1}{5} + \cos^2\theta = 1$

$\cos^2\theta = \frac{4}{5}$

$$\cos\theta = \frac{2}{\sqrt{5}}\cdot\frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$$

$(x')^2\,(8\cos^2\theta + 17\,\text{sen}^2\theta - 12\cos\theta\,.\,\text{sen}\,\theta)$

$8\cdot\left(\frac{2\sqrt{5}}{5}\right)^2 + 17\cdot\left(\frac{\sqrt{5}}{5}\right)^2 - 12\cdot\frac{2\sqrt{5}}{5}\cdot\frac{\sqrt{5}}{5}$

$8\cdot\frac{4\cdot\cancel{5}}{\cancel{25}\;5} + 17\cdot\frac{\cancel{5}}{\cancel{25}\;5} - 12\cdot\frac{2\cdot\cancel{5}}{\cancel{25}\;5}$

$\frac{32}{5} + \frac{17}{5} - \frac{24}{5} = \frac{25}{5} = 5$

$(y')^2\,(8\,\text{sen}^2\theta + 17\cos^2\theta + 12\cos\theta\,.\,\text{sen}\,\theta)$

$8\cdot\left(\frac{\sqrt{5}}{5}\right)^2 + 17\cdot\left(\frac{2\sqrt{5}}{5}\right)^2 + 12\cdot\frac{2\sqrt{5}}{5}\cdot\frac{\sqrt{5}}{5}$

$8\cdot\frac{\cancel{5}}{\cancel{25}\;5} + 17\cdot\frac{4\cdot\cancel{5}}{\cancel{25}\;5} + 12\cdot\frac{2\cdot\cancel{5}}{5\;\cancel{25}}$

$\frac{8}{5} + \frac{68}{5} + \frac{24}{5} = \frac{100}{5} = 20$

$5(x')^2 + 20(y')^2 - 20 = 0$

$5(x')^2 + 20(y')^2 = 20 \quad \div 20$

$\frac{5(x')^2}{20} + \frac{\cancel{20}(y')^2}{\cancel{20}} = \frac{\cancel{20}}{\cancel{20}}$

$$\boxed{\frac{(x')^2}{4} + (y')^2 = 1}$$

$a = 2$

$b = 1$

$1^2 = \sqrt{4 - c^2}^{\,2}$

$1 = 4 - c^2$

$c = \sqrt{3}$

$F_1 = (\sqrt{3}\,;\,0)$

$F_2 = (-\sqrt{3}\,;\,0)$

$C = (0,0)$

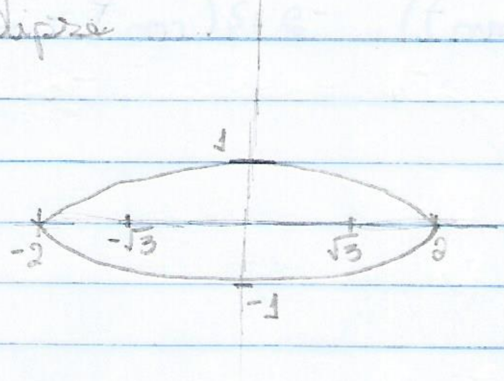
$A_1 = (2\,;\,0)$ $\quad B_1 = (0\,;\,1)$

$A_2 = (-2\,;\,0)$ $\quad B_2 = (0\,;\,-1)$

$e = \frac{\sqrt{3}}{2}$

tilibra

É uma elipse



2- $\beta(t) = (1 + 2(\cos t + \operatorname{sen} t), \ -2 + 4(\cos t - \operatorname{sen} t))$

$\beta(t) = ((1 + 2\cos t + 2\operatorname{sen} t), \ -2 + 4\cos t - 4\operatorname{sen} t))$

$x = 1 + 2(\cos t + \operatorname{sen} t)$

$y = -2 + 4(\cos t - \operatorname{sen} t)$

$$\begin{cases} \dfrac{x-1}{2} = \cos t + \operatorname{sen} t \\[2ex] \dfrac{y+2}{4} = \cos t - \operatorname{sen} t \end{cases}$$

$$\left(\frac{x-1}{2}\right) = \operatorname{sen} t \quad + \left(\frac{y+2}{4}\right) + \operatorname{sen} t$$

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

$\lambda^2-4=0$ $\quad$ $9-\lambda^2=0$ $\quad$ $2\lambda^2-2\lambda=0$

$\lambda=\pm 2$ $\quad$ $\lambda=\pm 3$ $\quad$ $\lambda(2\lambda-2)=0$

$\lambda=0 \quad \lambda=1$

	$\lambda<-3$	$\lambda=-3$	$-3<\lambda<-2$	$\lambda=-2$	$-2<\lambda<0$	$\lambda=0$	$0<\lambda<1$	$\lambda=1$
λ^2-4	+	+	+	0	−	−	−	−
$9-\lambda^2$	−	0	+	+	+	+	+	+
$\lambda^2-\lambda$	+	+	+	+	−	0	−	0
λ	−	−	−	−	−	0	+	+

$1<\lambda<2$	$\lambda=2$	$2<\lambda<3$	$\lambda=3$	$\lambda>3$
−	0	+	+	+
+	+	+	0	−
+	+	+	+	+
+	+	+	+	+

Portanto, se:

$\lambda<-3$ é um hiperbolóide de duas folhas

$\lambda=-3$ é conjunto vazio

$-3<\lambda<-2$ é conjunto vazio

$\lambda=-2$ é conjunto vazio

$\lambda=0$ é um união de dois planos concorrentes

$-2<\lambda<0$ é um hiperbole de uma folha

$\lambda=1$ é um cilindro hiperbólico

$0<\lambda<1$ é uma hipérbole de duas folhas

$\lambda=2$ é um cilindro elíptico

$1<\lambda<2$ é uma hipérbole de uma folha

$\lambda=3$ é um cilindro elíptico

$2<\lambda<3$ é um elipsóide

$\lambda > 3$ é uma hipérbole de uma folha.

4_

$r: \begin{cases} x = -1 + \lambda \\ y = 2 + 3\lambda \\ z = \lambda \end{cases}$ $s: \dfrac{x}{2} = \dfrac{y}{3} - 2 = \dfrac{z}{3} + 1$

$\dfrac{y-6}{3}$ $\dfrac{z+3}{3}$

a) $\vec{v_r} = (1, 3, 1)$ $\vec{v_s} = (2, 3, 3)$

$P_r = (-1, 2, 0)$ $Q_s = (0, 6, -3)$

$\dfrac{1}{2} \neq \dfrac{1}{3}$ $\rightarrow$ são concorrentes ou reversas. $\vec{PQ} = (1, 4, -3)$

$* \ [\vec{PQ}, \vec{v_r}, \vec{v_s}] = \begin{vmatrix} 1 & 4 & -3 \\ 1 & 3 & 1 \\ 2 & 3 & 3 \end{vmatrix} = \cancel{9} + 8 \cancel{-9} - (-18 + 3 + 12) = 11 \neq 0$

não é concorrente, então são reversas

$[\vec{v_r}, \vec{v_s}] = \begin{bmatrix} e_1 & e_2 & e_3 \\ 1 & 3 & 1 \\ 2 & 3 & 3 \end{bmatrix} = 9e_1 + 2e_2 + 3e_3 - (6e_3 + 3e_1 + 3e_2)$

$= 6e_1 - e_2 - 3e_3 = (6, -1, -3)$

b) $d(r, s) = \dfrac{|(1,3,1), (2,3,3)(1,4,-3)|}{\|(6,-1,3)\|}$ $* \rightarrow$ já foi calculado

$d(r, s) = \dfrac{11}{\sqrt{6^2 + (-1)^2 + 3^2}}$

$d(r, s) = \dfrac{11}{\sqrt{36 + 1 + 9}}$

$d(r, s) = \dfrac{11}{\sqrt{46}}$ m

c) Se $\vec{n_1} \times \vec{n_2} = (6, -1, -3)$ ele é $\perp$ a π_1 e π_2

Então $\pi_1 = 6x - y - 3z + d_1 = 0$ e $\pi_2 = 6x - y - 3z + d_2 = 0$

$P \in \pi_1$ então: $P = (-1, 2, 0)$

$6.(-1) - 2 + d_1 = 0$

$d_1 = +8$

$\pi_1: 6x - y - 3z + 8 = 0$

$Q \in \pi_2$ então: $Q = (0, 6, -3)$

$6.0 - 6 - 3.(-3) + d_2 = 0$

$-6 + 9 + d_2 = 0$

$d_2 = -3$

$\pi_2: 6x - y - 3z - 3 = 0$

d) $d(\pi_1, \pi_2) = d(P, \pi_2)$ $\quad P = (-1, 2, 0) \quad n = (6, -1, -3)$

$$d(P, \pi_2) = \frac{|6.(-1), (-1).2, (-3).0, -3|}{\sqrt{6^2 + (-1)^2 + (-3)^2}}$$

$$d(P, \pi_2) = \frac{|-6 - 2 - 3|}{\sqrt{46}} = \frac{11}{\sqrt{46}}$$