$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$

$4.A.C - B^2$

3_ $4.7.(-1) - 6^2 = -28 - 36 = -64 < 0$, portanto é uma hipérbole

$7x^2 + 6xy - y^2 + 28x + 12y + 28 = 0$

$7(x' \cos\theta - y' \operatorname{sen}\theta)^2 + 6.(x'\cos\theta - y'\operatorname{sen}\theta)(x'\operatorname{sen}\theta + y'\cos\theta)$
$-(x'\operatorname{sen}\theta + y'\cos\theta)^2 + 28(x'\cos\theta - y'\operatorname{sen}\theta) + 12(x'\operatorname{sen}\theta + y'\cos\theta)$
$+28 = 0$

$7[(x')^2\cos^2\theta - 2x'y'\cos\theta.\operatorname{sen}\theta + (y')^2\operatorname{sen}^2\theta]$
$+6[(x')^2\cos\theta.\operatorname{sen}\theta + x'y'\cos^2\theta - x'y'\operatorname{sen}^2\theta - (y')^2\cos\theta\operatorname{sen}\theta]$
$-[(x')^2\operatorname{sen}^2\theta + 2.x'y'\cos\theta\operatorname{sen}\theta + (y')^2\cos^2\theta]$
$+28[x'\cos\theta - y'\operatorname{sen}\theta]$
$+12[x'\operatorname{sen}\theta + y'\cos\theta] + 28 = 0$

$(x')^2(7\cos^2\theta + 6\cos\theta.\operatorname{sen}\theta - \operatorname{sen}^2\theta)$
$(x'y')(-14\cos\theta.\operatorname{sen}\theta + 6\cos^2\theta - 6\operatorname{sen}^2\theta - 2\cos\theta.\operatorname{sen}\theta)$
$(y')^2(7\operatorname{sen}^2\theta - 6\cos\theta.\operatorname{sen}\theta - \cos^2\theta)$
$(x')(28\cos\theta + 12\operatorname{sen}\theta)$
$(y')(12\cos\theta - 28\operatorname{sen}\theta)$

$-16\cos\theta.\operatorname{sen}\theta + 6\cos^2\theta - 6\operatorname{sen}^2\theta = 0 \div 2$
$-8\cos\theta.\operatorname{sen}\theta + 3\cos^2\theta - 3\operatorname{sen}^2\theta = 0 \div \cos^2\theta$
$-8\frac{\operatorname{sen}\theta}{\cos\theta} + 3 - 3\frac{\operatorname{sen}^2\theta}{\cos^2\theta} = 0$

$u = \operatorname{tg}\theta = \frac{\operatorname{sen}\theta}{\cos\theta} = \frac{1}{3}$

$-8u + 3 - 3u^2 = 0$
$-3u^2 - 8u + 3 = 0.(-1)$
$3u^2 + 8u - 3 = 0$

$\Delta = 64 - 4.(-3).3$
$\Delta = 64 + 36$
$\Delta = 100$

$u = \frac{-8 \pm 10}{6} = \frac{1}{3}$ ou -3

$$\begin{cases} 3\,\text{sen}\,\theta = \cos\theta \\ \text{sen}^2\theta + \cos^2\theta = 1 \end{cases}$$

$$\text{sen}^2\theta + 9\,\text{sen}^2\theta = 1$$

$$10\,\text{sen}^2\theta = 1$$

$$\text{sen}^2\theta = \frac{1}{10}$$

$$\text{sen}\,\theta = \frac{1}{\sqrt{10}} \qquad \cos\theta = \frac{3}{\sqrt{10}}$$

$$\begin{cases} x = \frac{3}{\sqrt{10}}x' - \frac{1}{\sqrt{10}}y' \\ y = \frac{1}{\sqrt{10}}x' + \frac{3}{\sqrt{10}}y' \end{cases}$$

$$(x')^2\,(7\cos^2\theta + 6\cos\theta\,.\,\text{sen}\,\theta - \text{sen}^2\theta)$$

$$7.\left(\frac{3}{\sqrt{10}}\right)^2 + 6.\frac{3}{\sqrt{10}}.\frac{1}{\sqrt{10}} - \left(\frac{1}{\sqrt{10}}\right)^2$$

$$7.\frac{9}{10} + 6.\frac{3}{10} - \frac{1}{10}$$

$$\frac{63}{10} + \frac{18}{10} - \frac{1}{10} = \frac{80}{10} = 8$$

$$(x'y')\,(-16\cos\theta\,.\,\text{sen}\,\theta + 6.\cos^2\theta - 6.\,\text{sen}^2\theta$$

$$-16.\frac{1}{\sqrt{10}}.\frac{3}{\sqrt{10}} + 6.\left(\frac{3}{\sqrt{10}}\right)^2 - 6.\left(\frac{1}{\sqrt{10}}\right)^2$$

$$-16.\frac{3}{10} + 6.\frac{9}{10} - 6.\frac{1}{10}$$

$$\cancel{\frac{-48}{10}} + \cancel{\frac{54}{10}} - \cancel{\frac{6}{10}} = 0$$

tilibra

$(y')^2(7\,\text{sen}^2\theta - 6\cos\theta \cdot \text{sen}\,\theta - \cos^2\theta)$

$7\left(\frac{1}{\sqrt{10}}\right)^2 - 6 \cdot \frac{3}{\sqrt{10}} \cdot \frac{1}{\sqrt{10}} - \left(\frac{3}{\sqrt{10}}\right)^2$

$7 \cdot \frac{1}{10} - 6 \cdot \frac{3}{10} - \frac{9}{10}$

$\frac{7}{10} - \frac{18}{10} - \frac{9}{10} = \frac{-20}{10} = -2$

$(x')(28\cos\theta + 12\,\text{sen}\,\theta)$

$28 \cdot \frac{3}{\sqrt{10}} + 12 \cdot \frac{1}{\sqrt{10}}$

$\frac{84}{\sqrt{10}} + \frac{12}{\sqrt{10}} = \frac{96}{\sqrt{10}} = \frac{96\sqrt{10}}{10} \div 2 = \frac{48\sqrt{10}}{5}$

$(y')(12\cos\theta - 28\,\text{sen}\,\theta)$

$12 \cdot \frac{3}{\sqrt{10}} - 28 \cdot \frac{1}{\sqrt{10}}$

$\frac{36}{\sqrt{10}} - \frac{28}{\sqrt{10}} = \frac{8}{\sqrt{10}} = \frac{8\sqrt{10}}{10} \div 2 = \frac{4\sqrt{10}}{5}$

$8(x')^2 - 2(y')^2 + \frac{48\sqrt{10}}{5}x' + \frac{4\sqrt{10}}{5}y' + 28 = 0 \quad \times 5$

$40(x')^2 - 10(y')^2 + 48\sqrt{10}\,x' + 4\sqrt{10}\,y' + 140 = 0 \quad \div 2$

$20(x')^2 - 5(y')^2 + 24\sqrt{10}\,x' + 2\sqrt{10}\,y' + 70 = 0$

$20\left((x')^2 + \frac{6\sqrt{10}}{5}x' + \left(\frac{3\sqrt{10}}{5}\right)^2\right) - 5\left((y')^2 + \frac{2\sqrt{10}}{5} + \left(\frac{\sqrt{10}}{5}\right)^2\right) + 70 = 0$

$20\left((x') + \frac{3\sqrt{10}}{5}\right)^2 - 5\left((y') + \frac{\sqrt{10}}{5}\right)^2 = -70 + 20 \cdot \frac{90}{25} - 5 \cdot \frac{10}{25}$

$$20\cdot\left(x' + \frac{3\sqrt{10}}{5}\right)^2 - 5\left(y' + \frac{\sqrt{10}}{5}\right)^2 = -70 + \frac{1800}{25} - \frac{50}{25}$$

$$20\left(x' + \frac{3\sqrt{10}}{5}\right)^2 - 5\left(y' + \frac{\sqrt{10}}{5}\right)^2 = 0$$

Portanto, é uma hipérbole degenerada.

$$7x^2 + 6xy - y^2 + 28x + 12y + 28 = 0$$

$$-y^2 + y(6x+12) + 7(x^2+4x+4) = 0$$

$A = -1 \quad B = (6x+12) \quad C = 7(x^2+4x+4)$

$$\Delta = (6x+12)^2 - 4.(-1).\,7(x^2+4x+4)$$

$$\Delta = 36x^2 + 144x + 144 + 28(x^2+4x+4)$$

$$\Delta = 64x^2 + 256x + 256 = 64.(x^2+4x+4)$$

$$y = \frac{-6x-12 \pm \sqrt{64(x^2+4x+4)}}{-2}$$

$$y = \frac{-6x-12 \pm 8\sqrt{(x+2)^2}}{-2}$$

$$y = \frac{-6x-12 \pm (8x+16)}{-2}$$

$$y' = \frac{-6x-12+8x+16}{-2} = \frac{2x+4}{-2} \Rightarrow y' = -x-2$$

$$y'' = \frac{-6x-12-8x-16}{-2} = \frac{-14x-28}{-2} \Rightarrow y'' = 7x+14$$

$$\begin{cases} y = -x-2 \\ y = 7x+14 \end{cases}$$

$7x + 14 = -x - 2$

$8x = -16$

$x = -2$

se x é -2 o valor de y é 0

Dessa forma, a hipérbole é degenerada e possui seu par de retas $y = -x - 2$ e $y = 7x + 14$, que se intersectam em $P(-2, 0)$.