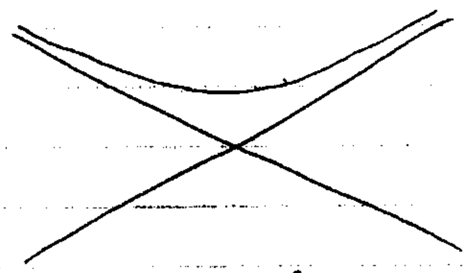
$$\Rightarrow \lambda_{1,2} = E_1 + E_2 \pm \sqrt{(E_1+E_2)^2 + 2|\vec{n}|^2}$$
$$= E \pm \sqrt{E^2 + 2|\vec{n}|^2}$$

$$\Rightarrow \left(E - \frac{A_{11}}{2}\right)\left(E - \frac{A_{22}}{2}\right) - \frac{A_{12}^2}{4} = \det A = \lambda_1 \lambda_2$$
$$= \frac{1}{4}\left(E^2 - E^2 - 2|\vec{n}|^2\right)$$
$$E_1 E_2 - \frac{A_{12}^2}{4} = -\frac{1}{4} K |\vec{M}|^2$$
$$\Rightarrow A_{12}^2 = 4E_1E_2 + 2\vec{n}^2$$

(b)



eqs for hyperbola

$$(x_1^2 + x_2^2)E - E_1 x_1^2 - E_2 x_2^2 - \pm\sqrt{4E_1E_2 + 2\vec{n}^2}\, x_1 x_2 = \frac{\vec{n}^2}{2}$$
(see (11))

$$\Rightarrow E_2 x_1^2 + E_1 x_2^2 - \frac{\vec{n}^2}{2} = \pm\sqrt{E_1E_2 + 2\vec{n}^2}\, x_1 x_2$$

asymptotes $x_1 \to \infty$, $x_2 \to \infty$

$$\Rightarrow E_2 x_1^2 + E_1 x_2^2 - \pm\sqrt{4E_1E_2 + 2\vec{n}^2}\, x_1 x_2 = 0$$

$$\Rightarrow x_2 = \frac{\sqrt{4E_1E_2 + 2\vec{n}^2}\, x_1 \pm \sqrt{(E_1E_2 + 2\vec{n}^2)x_1^2 - 4E_1E_2 x_1^2}}{2E_1}$$

$$x_2 = \left(\sqrt{E_1E_2 + 2\vec{n}^2} \pm \sqrt{4\cancel{E_1E_2} + 2n^2 - 4\cancel{E_1E_2}}\right)\frac{x_1}{2E_1}$$
$$= \left(\sqrt{4E_1E_2 + 2\vec{n}^2} \pm \sqrt{2\vec{n}^2}\right)\frac{x_1}{2E_1}$$