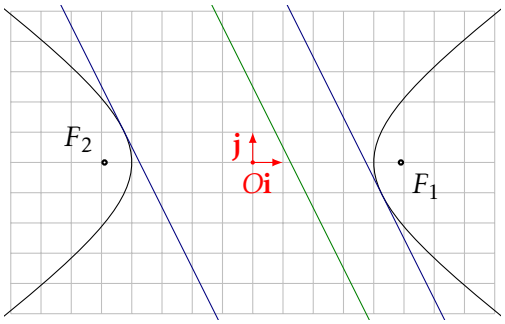
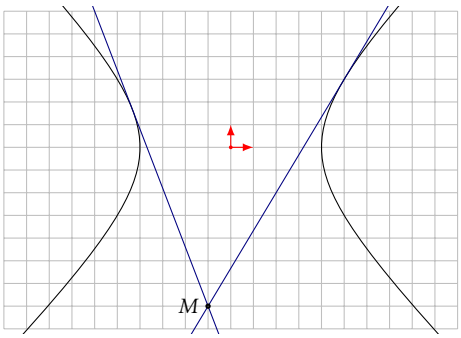
1. Determine the intersection points between the line $\ell : 2x - y - 10 = 0$ and the hyperbola $\mathcal{H} : \frac{x^2}{20} - \frac{y^2}{5} - 1 = 0$.

2. Determine the tangents to the hyperbola $\mathcal{H} : \frac{x^2}{16} - \frac{y^2}{8} - 1 = 0$ which are parallel to the line $\ell : 4x + 2y - 5 = 0$.



3. Determine the tangents to the hyperbola $\mathcal{H} : x^2 - y^2 = 16$ which contain the point $M(-1, 7)$.



4. Determine the relations between the coordinates (x_P, y_P) of the point P such that P does not belong to any tangent line to the hyperbola

$$\frac{x^2}{4} - \frac{y^2}{9} = 1.$$

5. Find the area of the triangle determined by the asymptotes of the hyperbola $\mathcal{H} : \frac{x^2}{4} - \frac{y^2}{9} - 1 = 0$ and the line $\ell : 9x + 2y - 24 = 0$.

6. Find an equation for the tangent lines to:

a) the hyperbola $\mathcal{H} : \frac{x^2}{20} - \frac{y^2}{5} - 1 = 0$, orthogonal to the line $\ell : 4x + 3y - 7 = 0$;

b) the parabola $\mathcal{P} : y^2 - 8x = 0$, parallel to $\ell : 2x + 2y - 3 = 0$.

7. Find an equation for the tangent lines to:

a) the hyperbola $\mathcal{H}: \frac{x^2}{3} - \frac{y^2}{5} - 1 = 0$, passing through $P(1,-5)$;

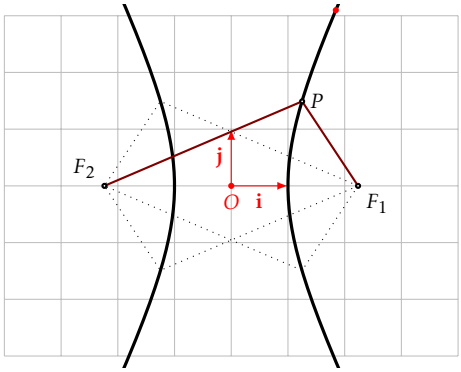
b) the paraola $\mathcal{P}: y^2 - 36x = 0$, passing through $P(2,9)$.

8. Consider the hyperbola $\mathcal{H}: x^2 - \frac{y^2}{4} - 1 = 0$ with focal points F_1 and F_2. Find the points M situated on the hyperbola such that

a) The angle $\measuredangle F_1MF_2$ is right;

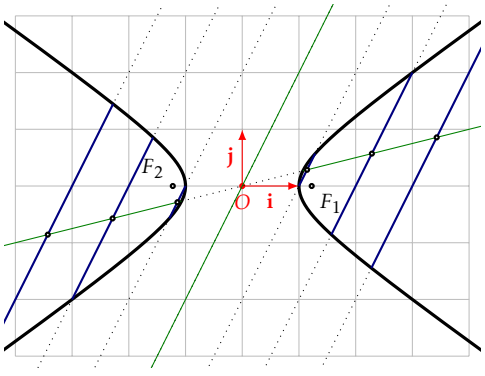
b) The angle $\measuredangle F_1MF_2$ is $60°$;

c) The angle $\measuredangle F_1MF_2$ is θ.



9. Consider the tangents to the parabola $\mathcal{P}: y^2 - 10x = 0$ passing through the point $P(-3,12)$. Calculate the distance from the point P to the chord of the parabola which is formed by the two contact points.

10. Consider the hyperbola $\mathcal{H}: x^2 - 2y^2 = 1$. Determine the geometric locus described by the midpoints of the chords of $\mathcal{H}$ which are parallel to the line $2x - y = 0$.



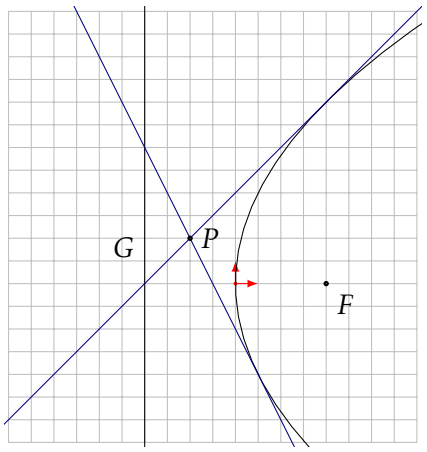
11. For which value k is the line $y = kx + 2$ tangent to the parabola $\mathcal{P} : y^2 = 4x$?

12. Consider the parabola $\mathcal{P} : y^2 = 16x$. Determine the tangents to $\mathcal{P}$ which are

a) parallel to the line $\ell : 3x - 2y + 30 = 0$;

b) perpendicular to the line $\ell : 4x + 2y + 7 = 0$.

13. Determine the tangents to the parabola $\mathcal{P} : y^2 = 16x$ which contain the point $P(-2, 2)$.



14. Using the gradient, prove the reflective properties of the hyperbola and of the parabola.