I. *Draw carefully the hyperbola of equations* $y = \dfrac{A}{x-L} + H$ *by applying the changes of variables defined by* $X = x - L$ *and* $Y = y - H$ *with* $Y = \dfrac{A}{X}$

- $(H_1)\, y = \dfrac{1}{x-3} + 2$

- $(H_2)\, y = -\dfrac{4}{x+4} + 2$

II. *Change the equation* $y=\dfrac{ax+b}{cx+d}$ *into* $y=\dfrac{A}{x-L}+H$ *then draw the corresponding Hyperbola in showing the asymptotes and the symmetries.*

• $(H_3)y=\dfrac{x-1}{x+3}$

Find A, H, L to change the equation into

$$y=\frac{A}{x+3}+H$$

and draw the hyperbola.

• $(H_4)y=\dfrac{2x+5}{x-2}$

Find A, H, L to change the equation into

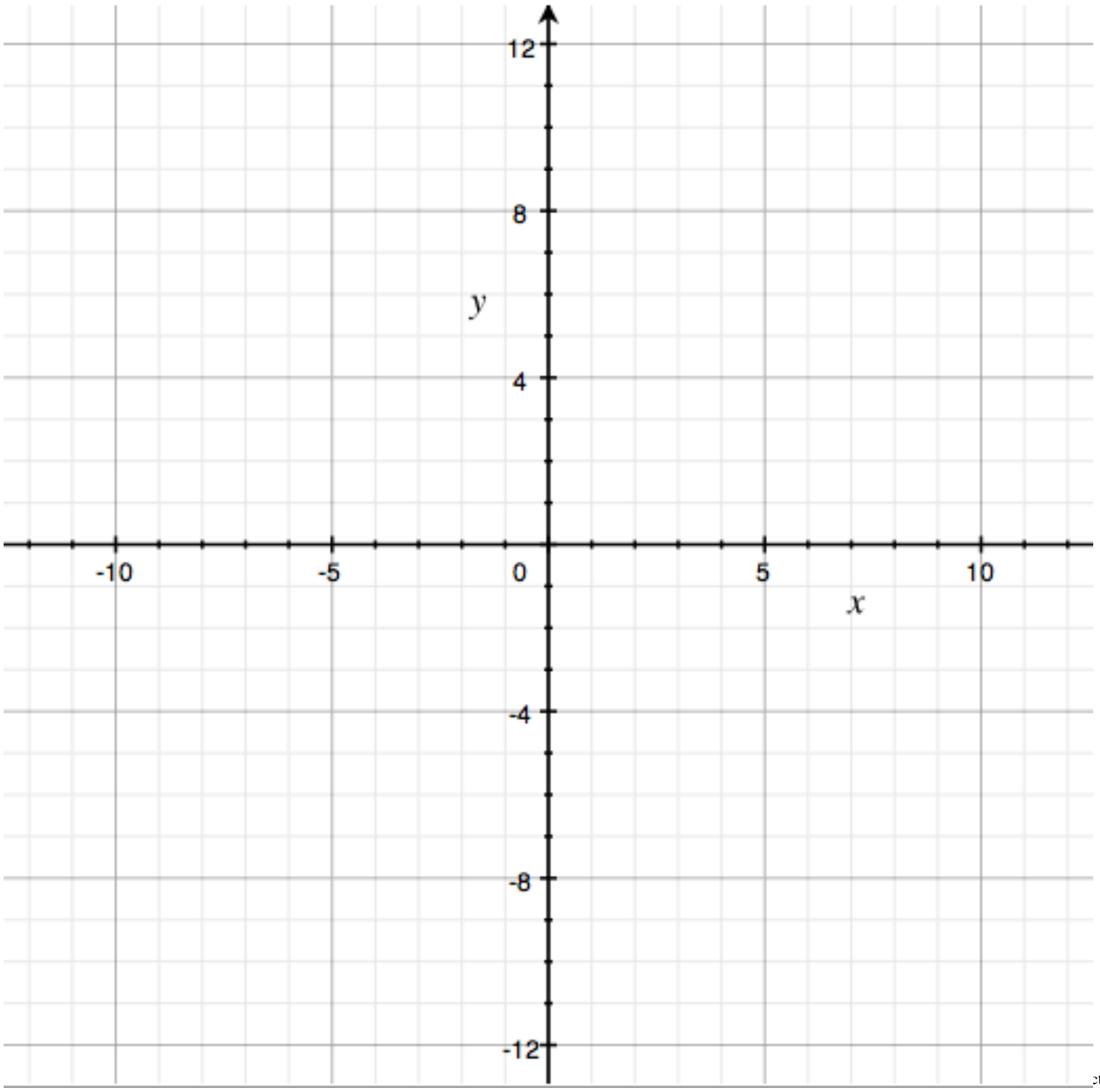
$$y=\frac{A}{x-2}+H$$

and draw the hyperbola.

III – Parabolas and Hyperbolas : *Let* $f(x) = -\frac{1}{4}x^2 - x + 3$ $g(x) = \frac{2x+12}{x+4}$

1. *Draw carefully the graphs of the two functions in the same system of coordinates below.*
   Show the axis of symmetry of the Parabola and the asymptotes of the Hyperbola
2. *Calculate and show the coordinates of intersections with the 0x and the 0y axes.*
3. *Solve the equation f(x) = g(x) to find the coordinates of the intersection points of the Parabola and the Hyperbola.* ***Show your calculations on the space provided below.***

4. *Shade the area of points (x;y) corresponding to the system :* $\begin{cases} y \le -\frac{1}{4}x^2 - x + 3 \\ y \ge \frac{2x+12}{x+4} \end{cases}$



IV – Parametric problem :

Let (D_m) be the variable straight line defined by $\mathbf{y = x + m}$
and let (H) be the equilateral hyperbola defined by $y = \frac{3x+2}{x+2}$

1. Draw the hyperbola (H) and the lines *(D_0), (D_1) (D_4), (D_9), (D_{10}).*
2. *Discuss upon the values of m the number of intercepting points between (H) and (D_m).* ***Show the calculations below*** *and check on the graph.*
3. *What special property can you observe about (D_1) and (D_9) ?*