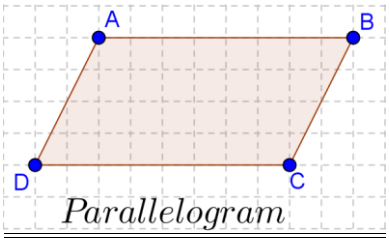
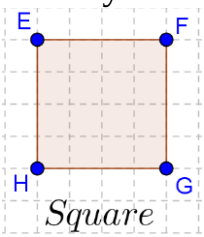
❖ Center of symmetry of a polygon:

I- Consider the following polygons:

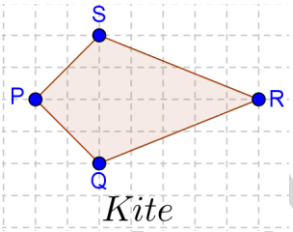
a. Determine the center and axis of symmetry for each of the following figures if it exists:



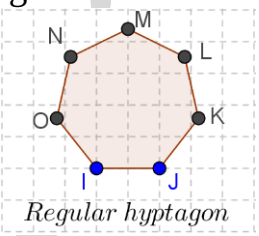
Parallelogram



Square



Kite



Regular hyptagon

Center: …….. …… …… ……

Axis: …… …… …… ……

b. Define a center of symmetry of a polygon:

……

❖ Center of symmetry of a rational function:

➢ How to prove that a point is a center of symmetry for the graph of a function?

II- On the adjacent figure $A(x; f(x))$ is any point on the curve of a numerical function f.

a. Determine the values of x for which f is defined.

……

b. If $C(a;b)$, is the center of symmetry of C_f, then locate the point B the symmetric of A with respect to a point C.

c. As A varies on C_f, where would the point B move? ……

d. What is the relative position of C w.r.t $[AB]$?

……

e. Determine the coordinates of B:

……

……

f. Deduce the relation: $f(x)+y_B=2b$

……

g. When is the relation $f(x)+f(2a-x)=2b$ valid?

……

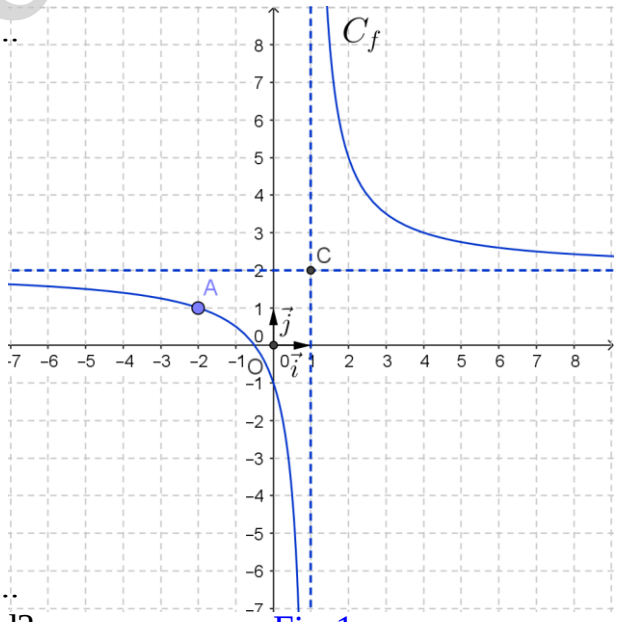


Fig-1.

h. List the steps to prove that a point is a center of symmetry for the graph of a function

……

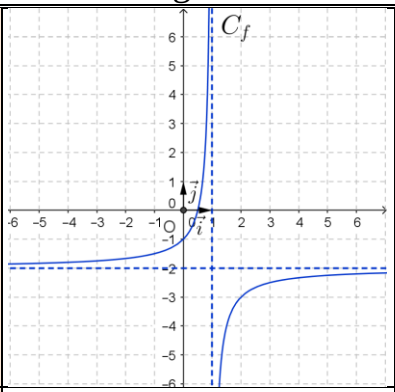
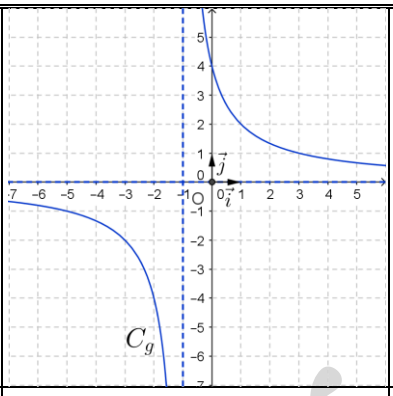
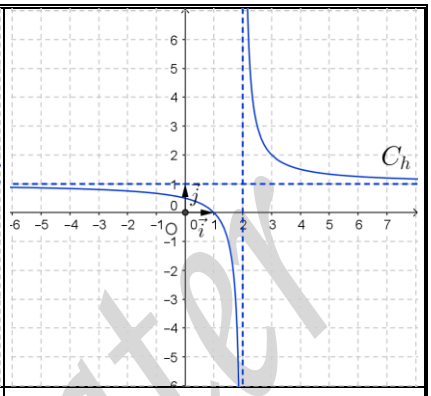
……

……

……

➢ How to determine center of symmetry of rational functions?

III- Consider the following table:

Graphs			
Asymptotes			
Center of symmetry	$I(1;-2)$		

a) Complete the above table.

b) What do you notice in the above table?

……

c) What do you conclude?……

d) Does your conclusion work for all degrees for rational functions?

……

❖ <u>Center of symmetry of a quadratic function</u>:

IV- Consider the function h defined by $h(x)=x^2-4x+1$

a. Is the domain of h centered at origin? Justify.

……

b. Determine $h'(x)$: ……

c. Find coordinates of S the absolute minimum of C_h.

……

……

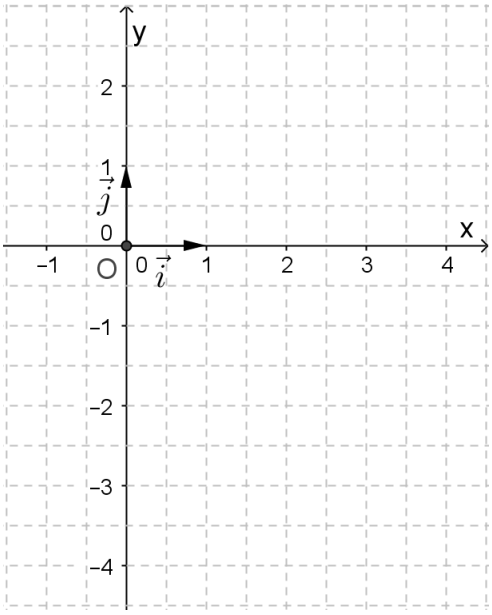
d. Complete the following table of variation:

Values of x	$-\infty$		$+\infty$
$h'(x)$			
$h(x)$			

e. Trace on the adjacent grid the curve of h.

f. Does the C_h, admit a center of symmetry? Justify.

……

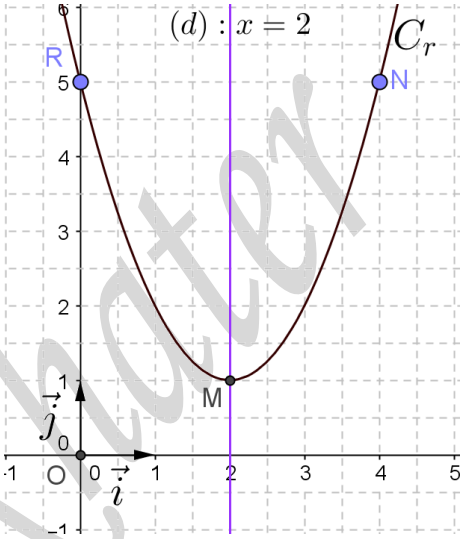


<u>Fig-2.</u>

❖ Axis of symmetry of a quadratic function:

➢ How to prove that a straight line is an axis of symmetry for the graph of a function?

V- Let $R(x, r(x))$ be a point on the function r defined by its curve C_r and the straight line, $(d): x = 2$, to be its axis of symmetry.



a. Is the domain of r centered at origin?

……

b. Use C_r to determine $r(x)$. ……

c. Justify the placement of N the symmetric of R *w.r.t* (d).

……

d. Compare the ordinates of N & R.

……

e. Let $I(a,b)$ be the midpoint of $[RN]$.

1. Locate I.
2. Determine the abscissa of N in terms of a.

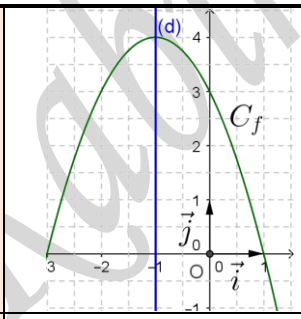
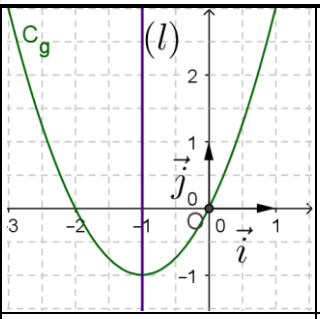
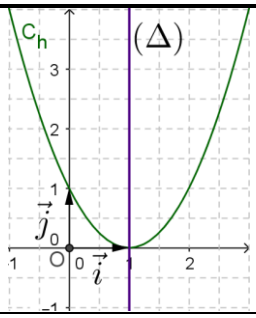
……

f. When is the relation, $r(x) = r(2a - x)$ valid? ……

g. How can we prove that the straight line $(d): x = a$ is an axis of symmetry for a function f ? ……

➢ How to find the equation of the axis of symmetry for the graph of a function?

VI- In the table below $(d), (l)$ & (Δ) are the respective axes of symmetries of C_f, C_g & C_h.

Graphs			
Image:	$f(x) =$	$g(x) =$	$h(x) =$
Derivative:	$f'(x) =$	$g'(x) =$	$h'(x) =$
Equate the derivatives to zero.			
Equation of axis of symmetry	$(d):$	$(l):$	$(\Delta):$

a) Complete the above table.

b) What do you notice in the above table?

……

c) What do you conclude?……

VII- Consider the function p defined by its image $p(x)=-x^2-2x+3$ and its curve C_p.

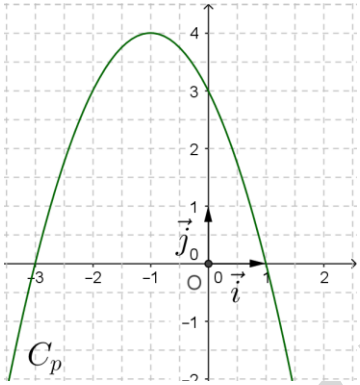


Fig-3.

a. Prove that: $p(x)=-(x+1)^2+4$. ……

b. Deduce the equation of the axis of symmetry of C_p. ……..

c. Can you use the same technique to find the axis of symmetry of higher polynomial functions? Justify. ……

d. Determine $p'(x)$: ……

e. Use the derivative of $p(x)$ to determine the equation of the axis of symmetry of C_p: ……