

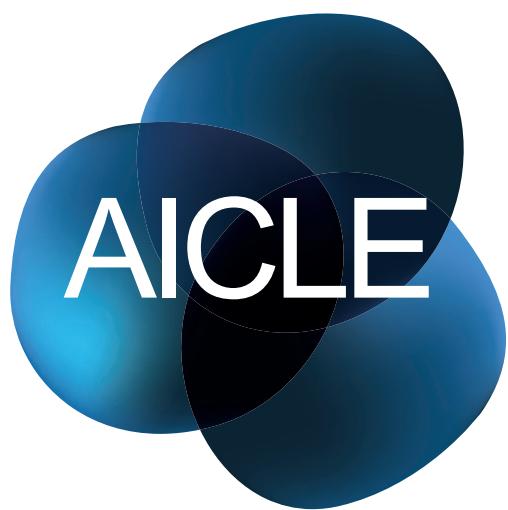
# Matemáticas

Secundaria



JUNTA DE ANDALUCÍA

Inglés



# Identificación del material AICLE

<b>TÍTULO</b>	Functions II
<b>NIVEL LINGÜÍSTICO SEGÚN MCER</b>	A1-A2
<b>IDIOMA</b>	Inglés
<b>ÁREA / MATERIA</b>	Matemáticas
<b>NÚCLEO TEMÁTICO</b>	Ecuaciones
<b>GUIÓN TEMÁTICO</b>	<ul style="list-style-type: none"> <li>- Puntos de corte con los ejes de una función.</li> <li>- Funciones afines, de proporcionalidad inversa y cuadráticas.</li> </ul>
<b>FORMATO</b>	Material didáctico en formato PDF
<b>CORRESPONDENCIA CURRICULAR</b>	3º de Educación Secundaria
<b>AUTORÍA</b>	Cristina López Lupiáñez
<b>TEMPORALIZACIÓN APROXIMADA</b>	Unas 7 sesiones (más las necesarias para la post-task)
<b>COMPETENCIAS BÁSICAS</b>	<p>Competencia en comunicación lingüística</p> <ul style="list-style-type: none"> <li>- Conocer, adquirir, ampliar y aplicar el vocabulario del tema</li> <li>- Ejercitarse en la lectura comprensiva de textos relacionados con el núcleo temático</li> </ul> <p>Competencia Matemática</p> <ul style="list-style-type: none"> <li>- Estudiar los puntos de corte con los ejes de una función básica.</li> <li>- Diferenciar, representar y analizar las características y elementos principales de funciones afines, de proporcionalidad inversa y cuadráticas.</li> </ul> <p>Aprender a aprender</p> <ul style="list-style-type: none"> <li>- Aprender a relacionar los conceptos tratados</li> <li>- Organizar las nociones, ideas y argumentos de forma ordenada y constructiva.</li> </ul> <p>Autonomía e iniciativa personal</p> <ul style="list-style-type: none"> <li>- Ser autónomos para realizar las actividades individuales</li> <li>- Tener capacidad de juicio crítico ante opiniones ajenas</li> <li>- Expresar ideas propias de forma argumentada</li> </ul>
<b>OBSERVACIONES</b>	<p>Esta unidad es continuación de la titulada Funciones I. Se pueden añadir más ejercicios para la práctica de los procedimientos estudiados. Deberán realizarse puestas en común de las actividades. Las funciones comunicativas de las actividades indican el propósito de las mismas.</p>

# Tabla de programación AICLE

<b>OBJETIVOS</b>	<ul style="list-style-type: none"><li>- Reconocer y plantear situaciones susceptibles de ser formuladas en términos matemáticos, elaborar y utilizar diferentes estrategias para abordarlas y analizar los resultados</li><li>- Actuar ante los problemas que se plantean en la vida cotidiana de acuerdo con modos propios de la actividad matemática, tales como la exploración sistemática de alternativas, la precisión en el lenguaje, la flexibilidad para modificar el punto de vista o la perseverancia en la búsqueda de soluciones</li><li>- Elaborar estrategias personales para el análisis de situaciones concretas y la identificación y resolución de problemas, utilizando distintos recursos e instrumentos y valorando la conveniencia de las estrategias utilizadas en función del análisis de los resultados y de su carácter exacto o aproximado</li></ul>						
<b>CONTENIDOS DE CURSO / CICLO</b>	Se añade a lo especificado en la unidad Functions I. (Bloque 5, Funciones y gráficas, Real Decreto 1631/2006) nociones básicas sobre funciones afines, de proporcionalidad inversa y cuadráticas.						
<b>TEMA</b>	<ul style="list-style-type: none"><li>- Estudio básico de los puntos de intersección (corte) de la gráfica de una función con los ejes cartesianos</li><li>- Función afines: elementos y características básicas</li><li>- Función de proporcionalidad inversa: elementos y características básicas</li><li>- Función cuadrática: elementos y características básica</li></ul>						
<b>MODELOS DISCURSIVOS</b>	<ul style="list-style-type: none"><li>- Preguntar el por qué de ciertas afirmaciones. Percibir la utilidad de las funciones para representar y estudiar fenómenos</li><li>- Reconocer y representar gráficamente funciones afines</li><li>- Determinar e interpretar la pendiente y la ordenada en el origen de una función afín</li><li>- Reconocer funciones de proporcionalidad inversa y cuadráticas: analizar sus elementos y características principales</li></ul>						
<b>TAREAS</b>	<ul style="list-style-type: none"><li>- Actividades para adquirir el vocabulario específico</li><li>- Actividades para la comprensión significativa y relacional de los conceptos tratados</li><li>- Ejercicios para practicar los procedimientos tratados</li><li>- Proyecto: Functions and reality</li></ul>						
<b>CONTENIDOS LINGÜÍSTICOS</b>	<table><tr><td><b>FUNCIONES:</b></td><td><b>ESTRUCTURAS:</b></td><td><b>LÉXICO:</b></td></tr><tr><td><ul style="list-style-type: none"><li>- Redactar argumentos y conclusiones.</li><li>- Argumentar respuestas.</li><li>- Exponer ejemplos, nociones e ideas.</li><li>- Expresar acuerdo o desacuerdo con las ideas de otros.</li></ul></td><td><ul style="list-style-type: none"><li>I think it has to be / it can be ...</li><li>I obtained the same solution because ...</li><li>I think you are wrong because ...</li><li>Don't you think there are more options?</li><li>I do because ...</li><li>This way we won't get anything useful because...</li><li>We have to consider that...</li><li>How do you calculate/ estimate/ define... this?</li><li>Why do you think so?</li></ul></td><td><ul style="list-style-type: none"><li>Intersection</li><li>Affine function.</li><li>Ordinate at the origin, slope.</li><li>Inverse proportionality function. Hyperbola, symmetry axis.</li><li>Quadratic function.</li><li>Parabola, branches (of a parabola), vertex.</li></ul></td></tr></table>	<b>FUNCIONES:</b>	<b>ESTRUCTURAS:</b>	<b>LÉXICO:</b>	<ul style="list-style-type: none"><li>- Redactar argumentos y conclusiones.</li><li>- Argumentar respuestas.</li><li>- Exponer ejemplos, nociones e ideas.</li><li>- Expresar acuerdo o desacuerdo con las ideas de otros.</li></ul>	<ul style="list-style-type: none"><li>I think it has to be / it can be ...</li><li>I obtained the same solution because ...</li><li>I think you are wrong because ...</li><li>Don't you think there are more options?</li><li>I do because ...</li><li>This way we won't get anything useful because...</li><li>We have to consider that...</li><li>How do you calculate/ estimate/ define... this?</li><li>Why do you think so?</li></ul>	<ul style="list-style-type: none"><li>Intersection</li><li>Affine function.</li><li>Ordinate at the origin, slope.</li><li>Inverse proportionality function. Hyperbola, symmetry axis.</li><li>Quadratic function.</li><li>Parabola, branches (of a parabola), vertex.</li></ul>
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<b>CRITERIOS DE EVALUACIÓN</b>	<ul style="list-style-type: none"><li>- Calcular adecuadamente los puntos de corte de la gráfica de una función con los ejes cartesianos</li><li>- Reconocer y representar una función afín, distinguir e interpretar la pendiente y la ordenada en el origen de una función afín</li><li>- Reconocer y representar una función de proporcionalidad inversa. Conocer los principales elementos y características de este tipo de funciones</li><li>- Reconocer y representar (en casos sencillos) una función cuadrática. Conocer los principales elementos y características de este tipo de funciones</li></ul>						

# INTERSECTION OF THE GRAPHIC OF A FUNCTION WITH THE CARTESIAN AXES

## Touching the line

In this section we will look at special points of the graphic of a function. They are points where the drawing of the function touches the Cartesian axes. Work in pairs.



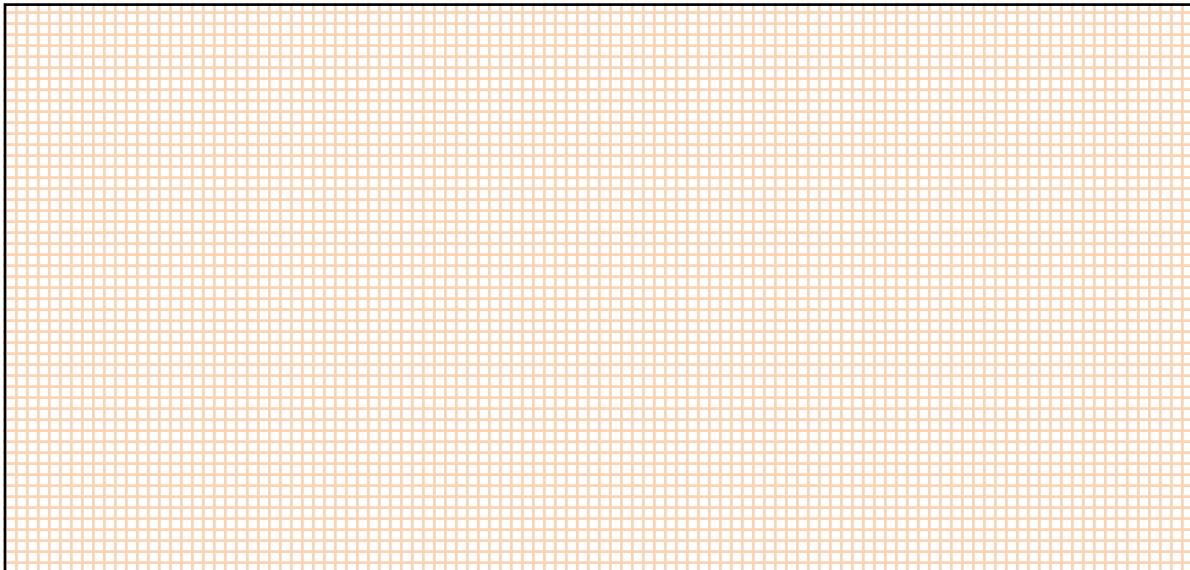
1) Discuss these questions with a partner:



a) Complete the table:

X	-1	0	2	3
$Y=x-3$	-4		-1	

b) Make a graphic representation of the function, using a table.



c) The graphic “touches” the axes in certain points... where? Write the abscissa and the ordinate of the points:

d) Complete: the ordinate of a point on the X-axis is always \_\_\_\_\_. The abscissa of a point on the Y-axis is always \_\_\_\_\_.

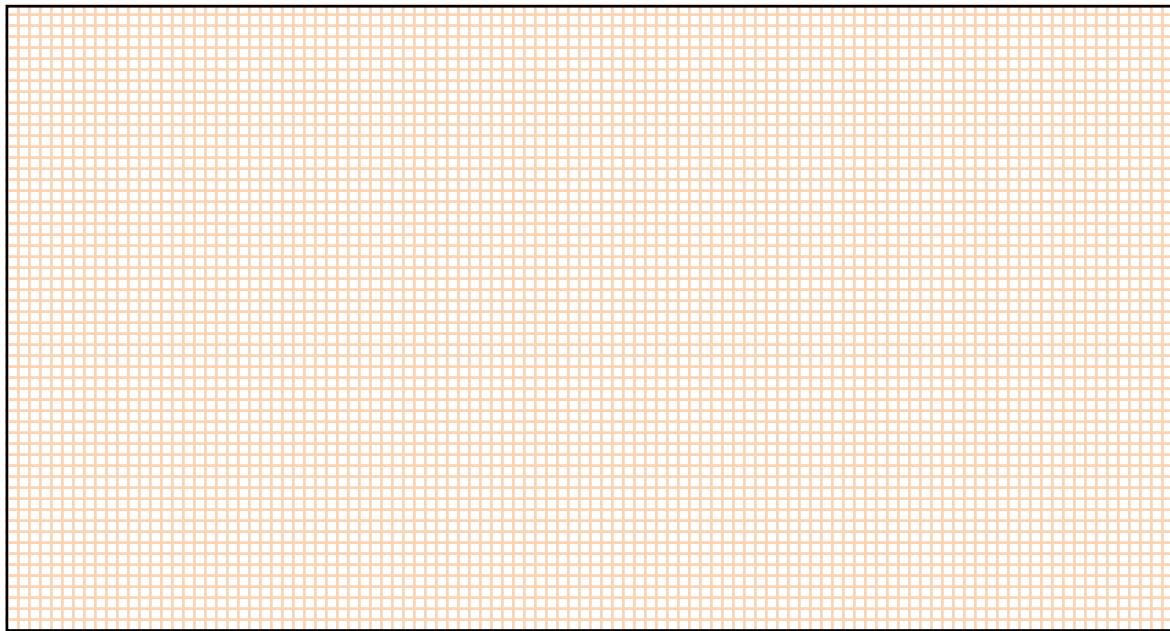
Write the answers to these questions.



If you want to know the point where the graphic of  $Y=3x-3$  “touches” the X-axis what can you do?

If you want to know the point where the graphic of  $Y=3x-3$  “touches” the y-axis what can you do?

Make a graphic of the function to check your answers.



Calculate the points of intersection with the axes of the graphics of these functions:

- $Y = x$
- $Y = 5x - 7$
- $Y = 5$
- $Y = x^2 - 4$
- $Y = 2x^2 + 5x - 4$
- $Y = 3x^2 - x + 10$
- $Y = +\sqrt{x}$

2) Listen and put the words in order. Work with a partner.



- intersection The of of the graphic of a function point with the X-axis has the  $(a,0)$ .
- more may be than point of intersection There one with the X-axis.
- calculate To this point/s second one you give the value calculate zero to the first coordinate and the (using the algebraic expression).
- of The point of the graphic of a function with the Y-axis has the form  $(0,b)$  intersection.
- will never You more than one point of find intersection with the Y-axis.
- solve you the equation  $y=0$  (or  $f(x)=0$  where  $f(x)$  is the To calculate this point algebraic expression).

New vocabulary: **intersection (with the axes).**



# AFFINE FUNCTIONS

New kind of functions:

In this section we are going to look at the affine functions. They are very similar to the linear functions (from before). Work in groups.



1) Similar but different.



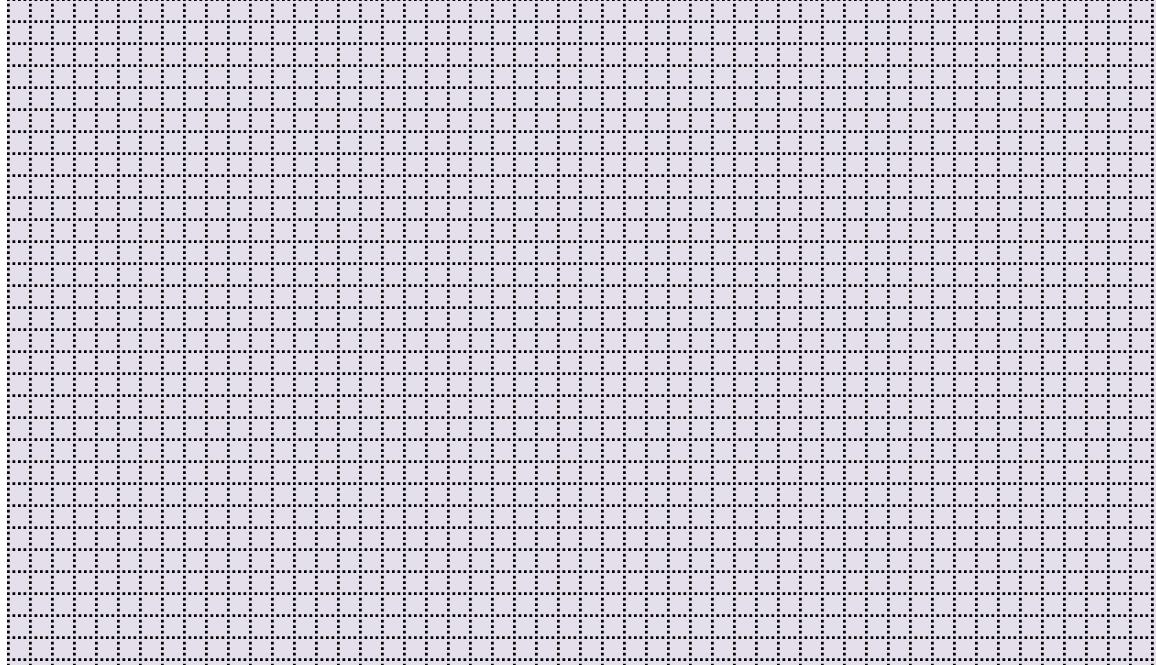
a) Do the value table and draw the graphic representation of these functions.

Answer the questions.

$$Y=3x$$

Value table:

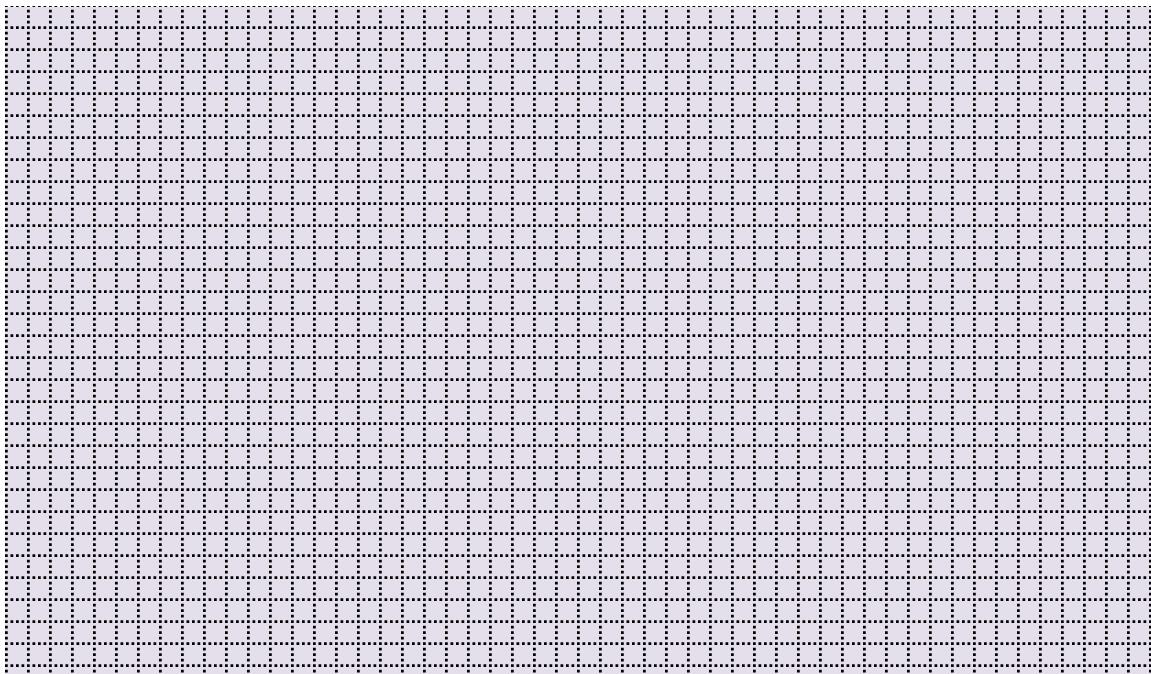
Graphic:



$$Y=3x+1$$

Value table:

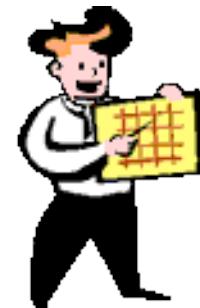
Graphic:



b) Are the **algebraic expressions different?** Why?

c) Are the **pictures different?** Why?

d) Prepare a short presentation.



**Share your answers with  
the rest of the class!**

**2) Important things about affine functions...**



a) In groups, discuss the text below and fill in the gaps.

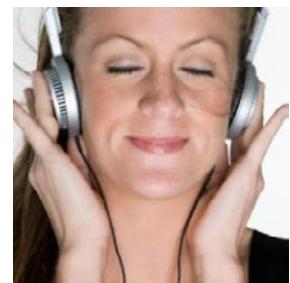
An affine function is a function that has an algebraic expression like this: \_\_\_\_\_

- The numbers of the expression are called \_\_\_\_\_ (with the same meaning as in linear functions) and ordinate at the origin (is the value of the ordinate for  $x=0$ , at the origin).
- The relationship between \_\_\_\_\_ and the increase/decrease is the same as in linear functions.
- A linear function is an affine function whose \_\_\_\_\_
- There can be \_\_\_\_\_ points of intersection with the axes, no more.

New vocabulary: **affine function, slope, ordinate at the origin.**

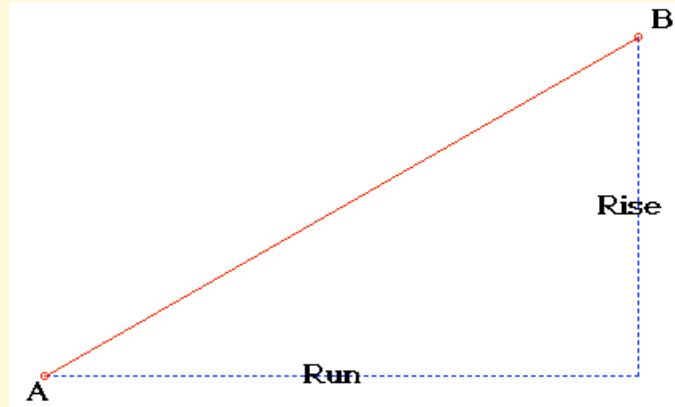


b) Now listen to your teacher to check you were right.



### Thinking...

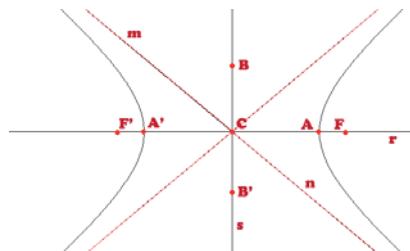
The slope is related to the angle of the graphic with the abscissa axis... investigate how.



# INVERSE PROPORTIONALITY FUNCTION

## Inverse proportionality functions

Work in groups.



1) Ecomath



You are member of Ecomath, an association that cares about nature.

You have discovered a substance that reduces contamination.

This table shows the information:

X = cl of substance used Y=Contamination level	20	30	50
	60	40	24

- a) If you use 100 cl of substance, what's the contamination level? If you use double the amount of substance the next day, does the level of contamination double or halve?

- b) Write the algebraic expression of the function that describes the situation. What's the domain?

c) Listen and fill the gaps with the words in the box:



A \_\_\_\_\_ with this \_\_\_\_\_ expression  $y = \underline{\hspace{2cm}}$  (   is a number  
different to   ) is an inverse \_\_\_\_\_ function.

zero    algebraic     $a/x$     proportionality    function     $a$

2) Draw the graphic representation of the function  $y=2/x$ .  
Use positive and negative values for  $x$ .



**3) The hyperbola: True or False? Compare your answers with other groups.**



The graphic is a line.

- The domain is the set of every numbers.
- The shape of the graphic is called hyperbola.
- The graphic has three different separated parts, called branches.
- One of the branches increases and the other decreases.
- There are four straight lines that cannot be crossed by the graphic.
- The Cartesian axes are symmetry axes.



**Your ideas:** If it were true then... / We realized it is true/false because...

**4) Let's draw!**

a) Do the graphic representation of these functions:

1.  $Y = -4x + 5$
2.  $Y = 6.21x$
3.  $Y = 7/x$

1.

2.

3.

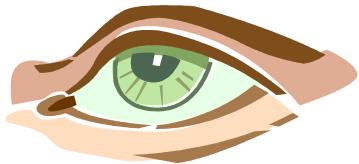
b) Match the expressions with the graphics above.



Put 1, 2 or 3. Put Ø if the expression doesn't describe any of the graphics.

Expressions	It is function	because
It's a linear function		
It's an affine function		
It's an increasing function		
It's an decreasing function		
It has a symmetry axis		
Every number is an element of the domain of the function		
It's a function of inverse proportionality		
Every number is an element of the range of the function		
There are local or global minima or maxima		
There aren't global maximum or minima.		

5) Now go back to function 3:  $y=7/x$ .



a) Look at the graphic and complete.

- The points of intersection with the abscissa axis are...

- The points of intersection with the ordinate axis are...

What can you say (for this kind of function) about the points of intersection with the axes?

b) Check your answers.

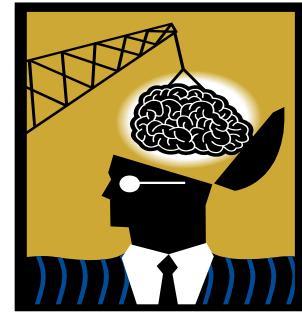


**New vocabulary:** inverse proportionality function, hyperbola, symmetry axes/axis.

7) One more step. Do you dare with something more complicated?



In group everything is easier!



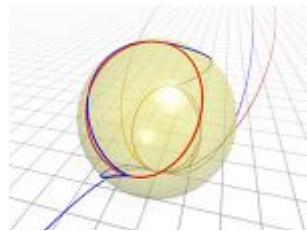
Draw the graphic expression of these functions and investigate the differences: domain, intersection with the axes, branches, growth...

1.  $Y = 5/x$
2.  $Y = 5 / x - 2$
3.  $Y = -4/x$
4.  $Y = -3 / 8 - 2x$

Notes:

# QUADRATIC FUNCTIONS

Work in pairs.



- 1) Imagine two numbers ( $x$  and  $m$ ) that total eight  
(example:  $x=2$  and  $m=6$ , because  $2+6=8$ ).

Complete:

- If  $x + m = 8$ , then  $m = \underline{\hspace{2cm}}$
- The product of both numbers is  $x \cdot m = \underline{\hspace{2cm}}$
- If you call the product  $y$  you obtain a function for the relationship between  $y$  and  $x$ .  
The algebraic expression of the function is  $y = \underline{\hspace{2cm}}$
- The value table of the function is:

<b>x</b>	-2		0		2		8		
<b>y</b>		-9		7		12		-20	-9200

- Draw the graphic of the function using the table:

A large yellow rectangular box for drawing the graph of the quadratic function.

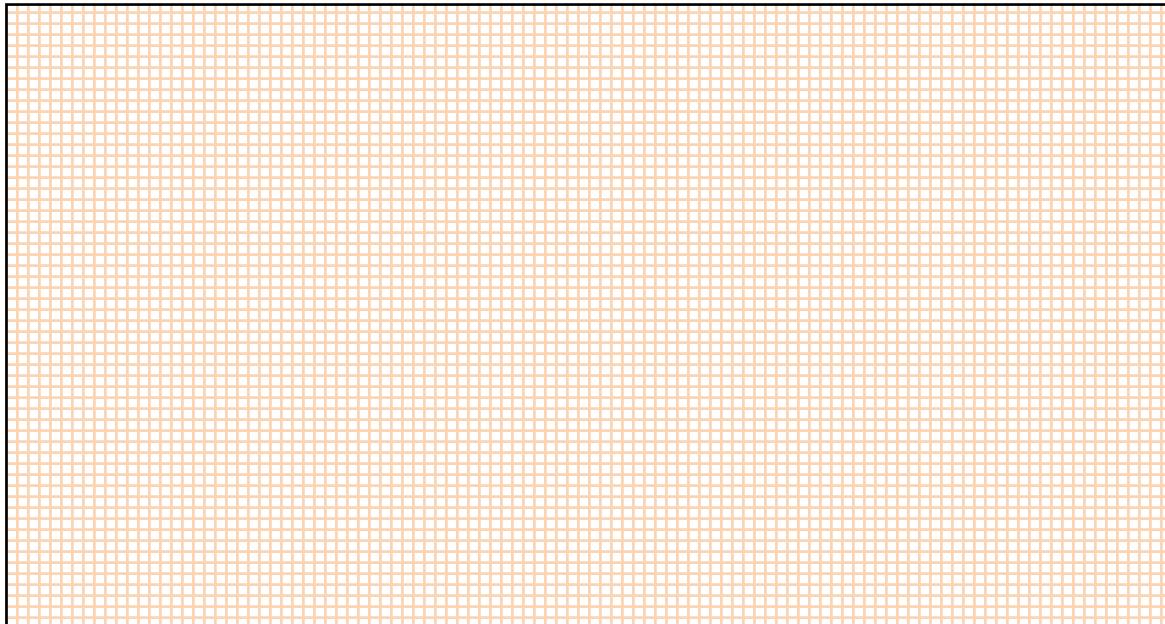
- What is a vertex? Use a dictionary. How many vertexes and branches can you see in your picture?

A large yellow rectangular box for writing the answer to the question about vertexes and branches.

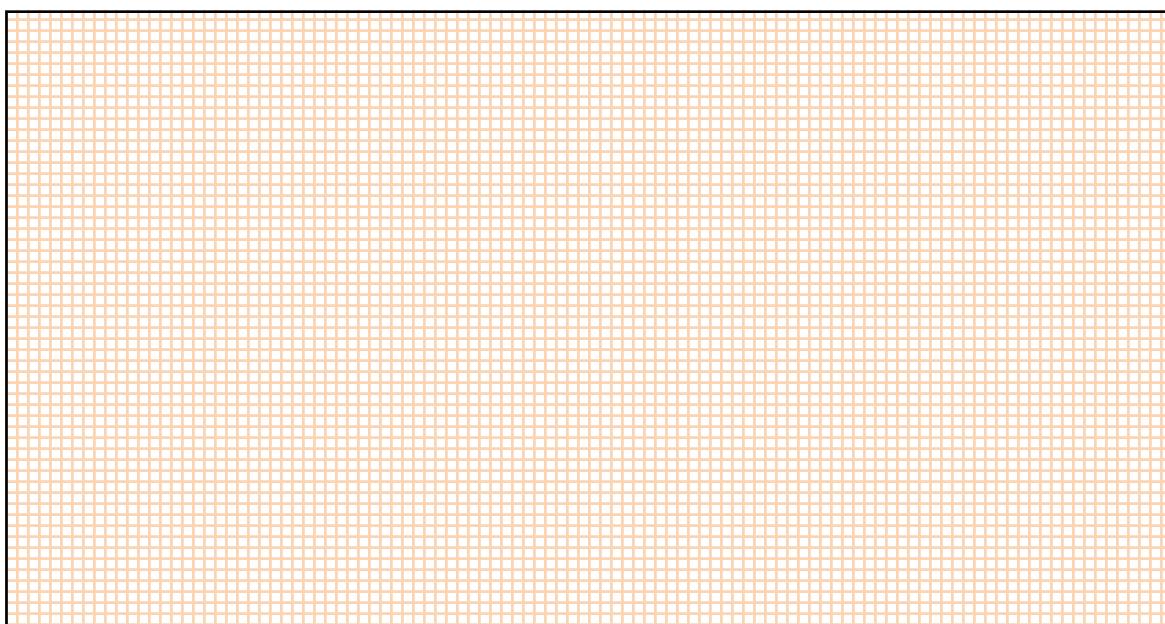
2) Draw the graphic representation of these functions:



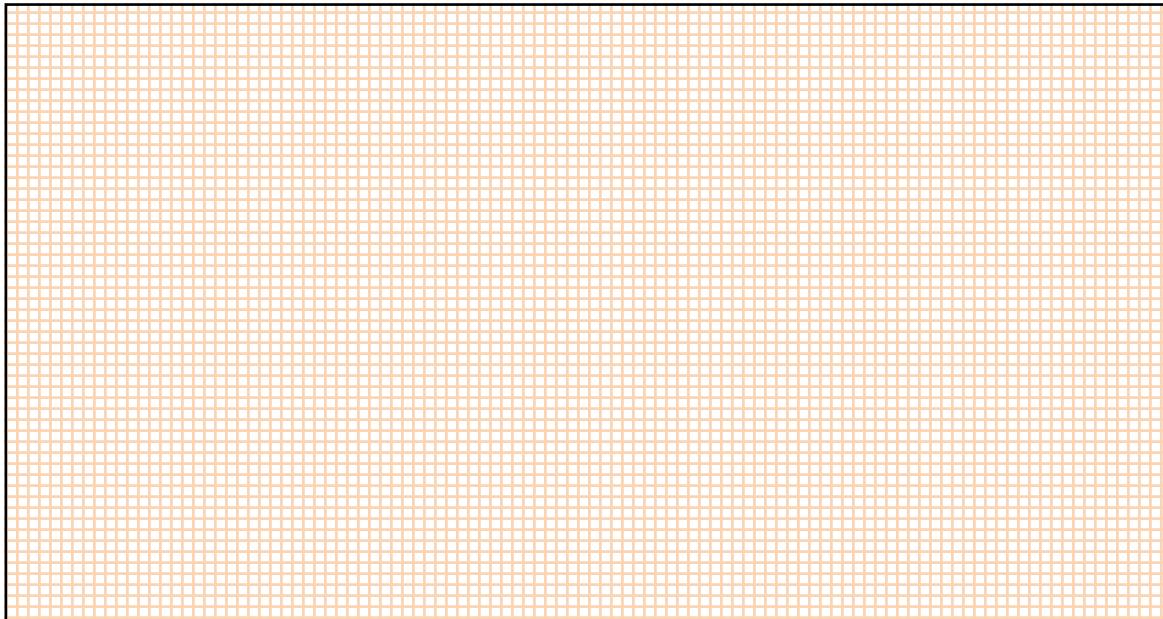
1.  $Y=2x^2$  (use  $x=0$  in your value table)



2.  $Y= -2x^2+4x$  (use  $x=0$ ,  $x=2$  in your value table)



3.  $Y=x^2-6x+9$  (use  $x=3, x=-3$  in your value table)



4.  $Y= -x^2+2x-5$  (use  $x=1$  in your value table)



3) True or false? Why?



- Each function is increasing.

It's true/false because...

- Each function has a vertex and two branches.

It's true/false because...

- Each graphic crosses both Cartesian axes.

It's true/false because...

**- Each function has a decreasing part.**

It's true/false because...

**- Each graphic crosses the ordinate axis.**

It's true/false because...

**- Every graphic crosses the axis of abscissas.**

It's true/false because...

#### 4) Defining:



a) Read the text and find the spelling mistakes. Correct them:

A cuadratic funtion is a function with this algebraic expresion:  
 $Y=ax^2+bx+c$  (a, b and c are numbers, a is never ecual to cero).

The shape of the graphic is a parabola, with a vertex (that is a global minimum or maximum, according to the sig of a), two branches and a symmetry axis.

b) Listen and match the two halves of the sentences:



If  $a=0$  the function  $y = ax^2+bx+c$  is not

so you can draw one and copy to obtain the other.



The symmetry axis of a quadratic function is parallel

quadratic but affine:

$$y = bc+c$$

The two branches are symmetric

to the ordinates axis (the Y-axis)

#### 5) Imagine the function $Y= x^2+2x-3$ and complete:



To find the points of intersection with the axis of abscissas you have to \_\_\_\_\_

\_\_\_\_\_, and you obtain \_\_\_\_\_  
\_\_\_\_\_.

To find the points of intersection with the axis of abscissas you have to \_\_\_\_\_  
\_\_\_\_\_, and you obtain \_\_\_\_\_  
\_\_\_\_\_.



New vocabulary: **quadratic function, parabola, vertex.**

6) More...



Consider the function  $y=f(x)=x^2-3x+2$ .

- i) Calculate the point of intersection of the graphic with the Cartesian axes.
- ii) Draw the graphic representation of the function, using the points calculated before and the value  $x=1.5$ .
- iii) What is the relationship between  $x=1.5$  and the points of intersection with the  $x$ -axis?
- iv) Can the point  $(1.5, f(1.5))$  be the vertex?
- v) Explore the function, giving as much information as you can.



# VOCABULARY GAME: PLAY WITH YOUR TEAM!

Now it's time to check the vocabulary you learnt.

Your teacher is going to write some words or expressions on the board but... some letters will be disordered or removed.



Every team will have to:

- Write the word or expression correctly (one point).
- If the correction is right, the team will have the chance to give an example of the word or expression (one extra point).

In groups. Prepare a concept map about what you have learnt in this unit. Explain it to the rest of the class.





## POST-TASK: FUNCTIONS AND REALITY



Functions are all around you.  
Work in groups.

Write a text describing three real situations in your daily life.  
You are going to write functions (an affine function, a quadratic function and an inverse proportionality function) for every case.

### Instructions:



- Write the situation.
- Write and represent the function.
- Indicate the main elements and the meaning of the elements in the situation.
- Choose one of the three situations and explain it to the rest of the class:
  - The real situation (what is it about).
  - The kind of function you chose.
  - How you represented the function.
  - The main characteristics of the function (increase, maxima or minima, domain, range, continuity, main points of the graphic...)
  - What the function tells you about the situation.

### Example situations:

- Telephone calls: price and time of duration (affine function).
- Dimensions and areas of houses or rooms (quadratic functions).
- People working and the time they spend on a task (inverse proportionality functions).

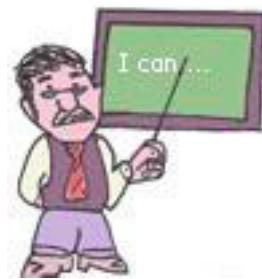
## WHAT YOU HAVE LEARNT:

With these activities you have learnt...

- How to study the points of intersection of graphics with Cartesian axes.
- What an affine function is. What the slope and the ordinate at the origin (of an affine function) are.
- What an inverse proportionality function is (and its elements and characteristics).
- What an hyperbola is and what its elements are. What a quadratic function is (and its elements and characteristics).
- What a parabola is. What the symmetry axis and the vertex of a quadratic function are.

## HOW WELL CAN YOU...?

### Assess yourself



	ALWAYS	SOME-TIMES	NEVER
<b>CONCEPTS</b>			
I understand and remember the concepts about functions I studied.			
<b>PRACTICE</b>			
I can study the points of intersection of a basic function with the Cartesian axis.			
I can recognize, represent and describe affine, quadratic and inverse proportionality functions and their elements.			
<b>LISTENING</b>			
I understand when someone talks about functions and main related concepts.			
<b>READING</b>			
I can read texts about situations related to functions and understand the most important information.			
<b>SPEAKING</b>			
I can talk about functions and their applications.			
<b>WRITING</b>			
I can describe situations where concepts related to functions are involved.			
<b>VOCABULARY</b>			
I recognize words and expressions related to functions.			

## CREDITS

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[http://en.wikipedia.org/wiki/File:Helianthus\\_whorl.jpg](http://en.wikipedia.org/wiki/File:Helianthus_whorl.jpg) (by L. Shyama)

<http://flickr.com/photos/nehemias/3148307618/> (by Nehemias)

<http://picasaweb.google.com/lh/photo/gPweg9E9VNZmmXYJJ-BxWw> (by Tokyo.)

<http://www.flickr.com/photos/aldoaldoz/1843965369/> (by aldoaldoz)

<http://es.wikipedia.org/wiki/Archivo:Logistic-curve.png> (by Maksim)

<http://office.microsoft.com> (collection of pre-designed images)