



# APRENDER SEMPRE

## 2ª SÉRIE ENSINO MÉDIO

### MATEMÁTICA

Dear student and caregiver,

To prevent the dissemination of the new coronavirus, and to preserve everyone's health, school activities were paralyzed to reduce the circulation of people. In order not to interrupt your school studies even during the period of suspension of classes, the State Secretary of Education has prepared some materials to support you at this moment.

This material is divided in two parts: one on Portuguese Language and the other one in Mathematics. Here you will find activities to enhance your knowledge. Also, two inserts are included: one with information about COVID-19 and the other one with guidelines and suggestions for you to organize a study routine and continue learning, even without going to school!

When you return to school, you must hand over the activities to your teacher. That way you can have feedback on what you managed to advance and be supported to learn even more!

Good luck with your studies!



Nome da Escola: \_\_\_\_\_

Nome do Aluno: \_\_\_\_\_

Data: \_\_/\_\_/2020

Ano/Turma 2ª Série EM \_\_\_\_\_

## Sequence 1

### Skill 09 – Identify the graphs of 1st and 2nd degree functions, knowing their coefficients.

1. A 2<sup>nd</sup> degree polynomial function is generically expressed by  $y = ax^2 + bx + c$ , where  $a$ ,  $b$  and  $c$  are real coefficients, with  $a \neq 0$ . Given the 2<sup>nd</sup> degree polynomial function expressed by  $y = -x^2 - 2x$ , please answer the following questions:

a. The values of the coefficients  $a$ ,  $b$  and  $c$  of the function.

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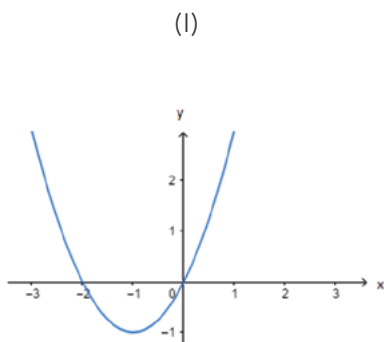
b. Determine the radices or zero of this function.

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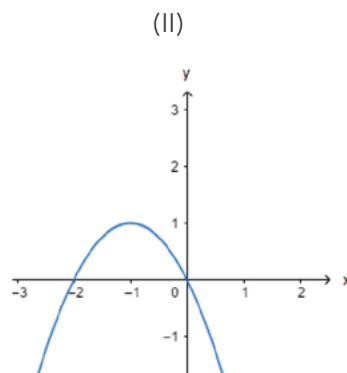


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c. The graph that better represents this function is:

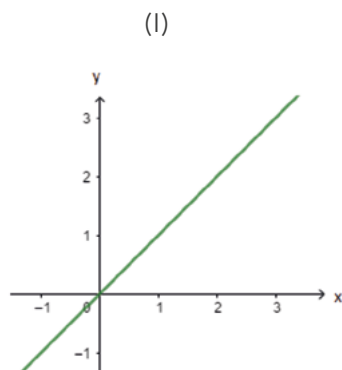


Fonte: Equipe pedagógica

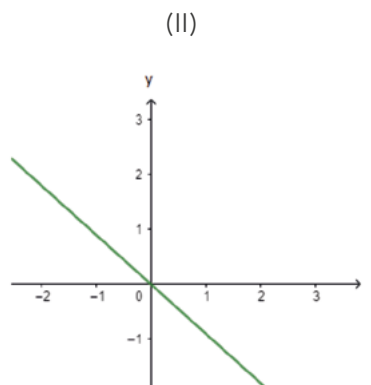


Fonte: Equipe pedagógica

2. Which of the following graphs best represents the function  $f(x) = ax + b$ , where  $a$  and  $b$  are real constants, with  $a < 0$  and  $b = 0$ ?

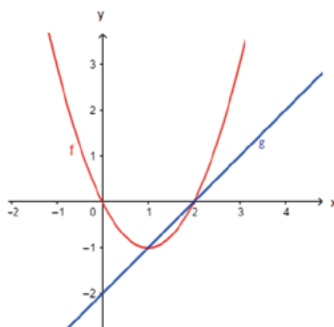


Fonte: Equipe pedagógica



Fonte: Equipe pedagógica

3. Observe the graphs of the functions  $f$  and  $g$  and answer the questions.



Fonte: Equipe pedagógica

4. Which one of the functions,  $f$  or  $g$ , represents a 2nd degree polynomial function (parabola)?

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- a. Calculate the radices or zeros of function  $f$ .

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- b. Calculate the radix or zero of function  $g$ .

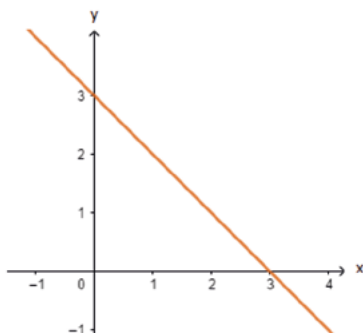
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- c. What are the coordinates of the intersection point of functions  $f$  and  $g$  on the  $x$ -axis?

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5. Note the function  $f$  represented in the Cartesian plane below:



Fonte: Equipe pedagógica

- a. What is the zero of function  $f$ ?

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- b. What is the intersection point of  $f$  with the  $y$ -axis?

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- c. What is the intersection point of  $f$  with the  $x$ -axis?

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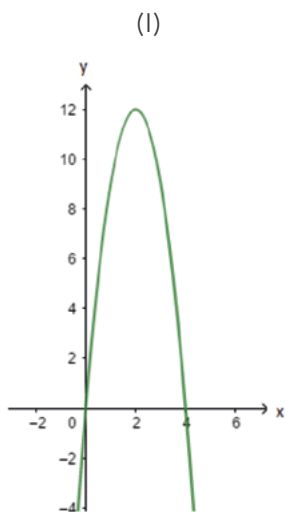
- d. The function  $f$  is crescent or decrescent?

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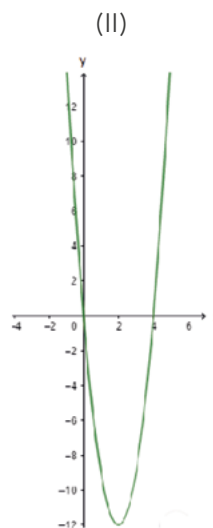
- e. Being that  $f$  is a function given by  $f(x) = ax + b$ , where  $a$  is the angular coefficient and  $b$  the linear coefficient, establish the equation representing the function represented in the Cartesian plane.

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6. A 2nd degree polynomial function is given by  $y = -3x^2 + 12x$ . The graph that better represents this function is:



Fonte: Equipe pedagógica



Fonte: Equipe pedagógica

## Sequence 2

### Skill 10 – Recognize the exponential function and its properties according to growth or decline

1. (ENEM, 2010) (Adaptada) One of the major problems of pollution of water sources (rivers, streams, and others) occurs by discarding used frying oil into interconnected pipes with the sewage system. Suppose families in a street discharge liters of frying oil through the pipes every week according to the table below:

Time (weeks)	Liters of frying oil discarded every week
1	10
2	100
3	1000
4	10000
5	100000



Looking at the table above, answer:

- a. What are the two magnitudes represented in the table?  
\_\_\_\_\_
- b. What is the prediction of liters of frying oil thrown in the 7th week?  
\_\_\_\_\_
- c. As weeks go by, what happens to the number of liters of frying oil discarded?  
\_\_\_\_\_
- d. How fast does the amount of frying oil that is discarded weekly in pipes increase?  
\_\_\_\_\_
- e. According to the table, the amount of liters of frying oil depends on what magnitude?  
\_\_\_\_\_
- f. What is the relationship between the time (weeks) and the amount of liters of frying oil (capacity) discarded into the pipes by families?  
\_\_\_\_\_

2. Complete the following table with the powers of 10:

Liters of frying oil per week	Power of 10
10	
100	
1000	
10000	
100000	

a. How many liters of frying oil represented by power of 10 would be discarded in the 23<sup>rd</sup> week?

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b. Describe, in your own words, a rule for calculating the amount of liters of frying oil discarded from the first week onwards.

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c. Using the rule described in the previous item, find a formula to associate the elements of the week column (time) with the liters of frying oil column (capacity).

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d. Look carefully at the numbers in the column liters of frying oil. Were they an exponential function? Justify your answer.

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e. Find out a formula to calculate the value discarded in the  $n$ th days. Use the letter  $x$  to represent the time variable (in weeks).

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f. In your formula, is the calculated value for  $x = 1$  equal to 10 for the number of liters of frying oil? Is the value for  $x = 3$ , equal to 1000? Check if your formula works for all the numbers in the table.

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3. Fill in the spreadsheet (table) to obtain some Cartesian coordinates of the function  $f(x)=4^{x+1}$ .

x	$f(x)=4^{x+1}$	Points (x, y)
-2		
-1,5		
-1		
-0,5		
0		
0,5		
1		
1,5		
2		

a. Analyze the values of  $f(x)=4^{x+1}$ . What happens to the y values found? Do they increase or decrease?

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b. Find the ordered pairs (x, y) found in the table in question (3), referring to the function  $f(x)=4^{x+1}$ , in a Cartesian plane. Use the following grid.





c. Analyze the points located in the Cartesian plane. What happens with the positioning points? Do the points go further south or north? Why does this happen?

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d. X values increase from half to half point. Do the values of Y follow this variation?

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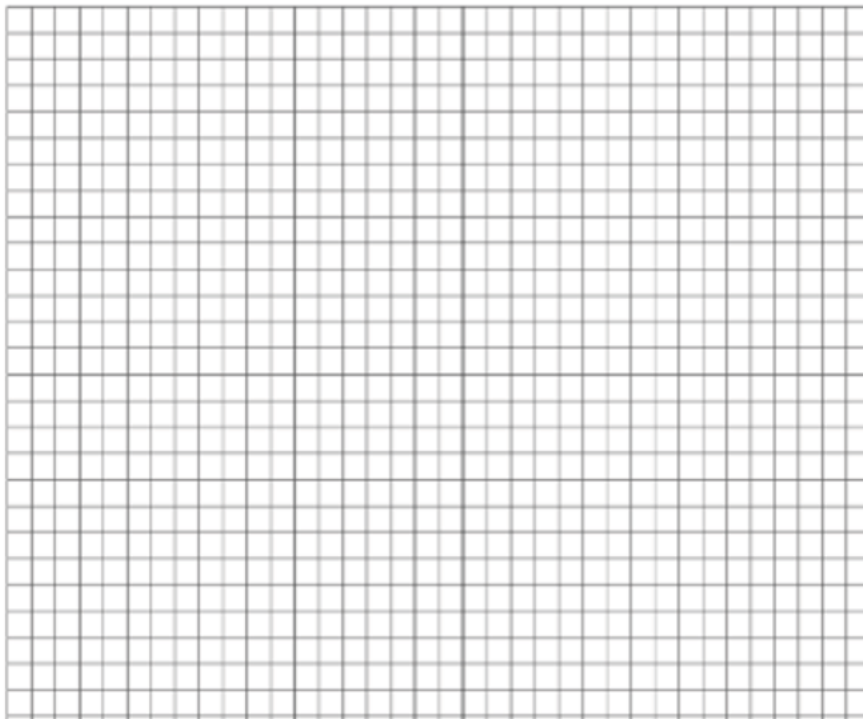
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e. What happens with the variation between the first and last points studied?

( ) increased at the same "rate" of x

( ) increases faster than the "rhythm" of x.

f. Draw a curve by joining the points found in item (a) using the following grid, obtaining the graph corresponding to the formation law  $f(x)=4^{x+1}$ .





4. Analyze the previous question (3) and answer the following questions:

**The exponential function** is a function where a constant number, greater than 0 (zero) and different from 1 (one), is raised to the exponent, which is a variable. The power of base in the function, the constant, cannot assume the value 1 (one), zero (0) and cannot be negative

- a. What is the value of the constant in the function  $f(x)=4^{x+1}$ ?

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- b. Which letter represents the variable in the function  $f(x)=4^{x+1}$ ?

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**Exponential function:** grows or decreases very fast, that is why we often use the expression "grew exponentially"

- c. We can conclude that the graph of the function  $f(x)=4^{x+1}$  built in the previous question (3) represents the graph of an exponential function? Justify your answer.

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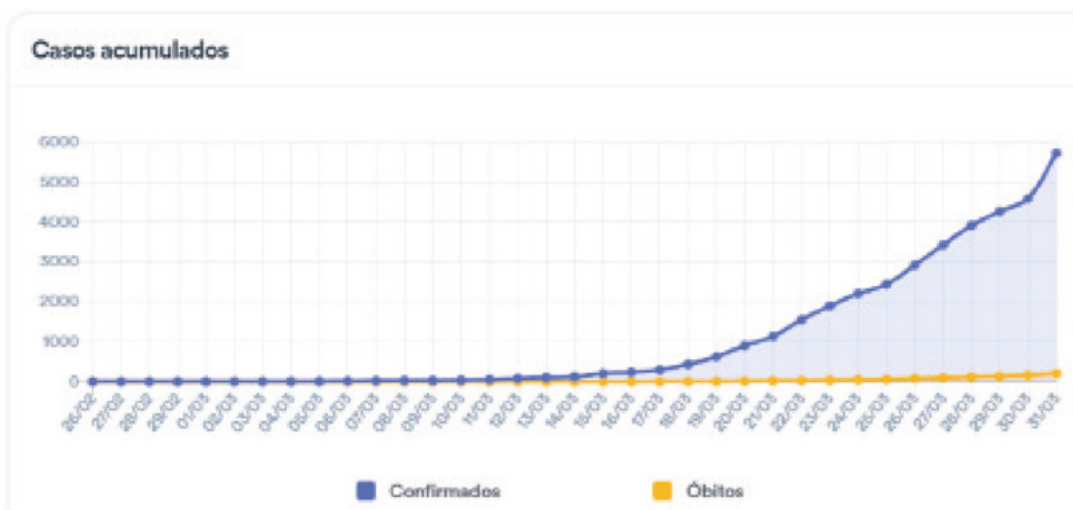
- d. Can we conclude that the graph of the function  $f(x)=4^{x+1}$  built in the previous question (3) represents the graph of an crescent exponential function? Justify your answer.

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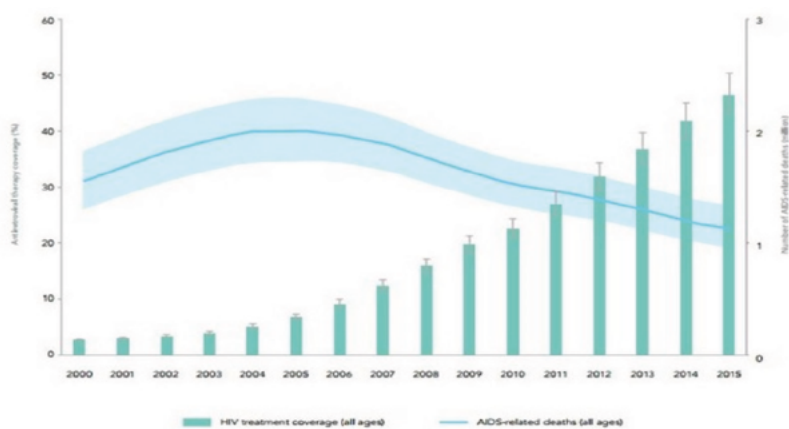
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5. The following graph shows the cases confirmed and deaths by Covid-19 up to March 31, 2020.



Fonte: DataSus/Ministère Santé.

The following graph shows the correlation between the number of AIDS deaths and treatment coverage.



Fonte: Unaid.

Analyze the graphs and answer the questions:

- a. How do the graphs presented above help understand the growing trend of these diseases?

- b. Saying that an illness grows exponentially, in fact, means that:

- ( ) Each infected person is capable of infecting a single person at a time.  
 ( ) Each infected person is able to infect more than one person at a time.



c. In relation to coronavirus, we can say that the exponential growth is one in which:

( ) The more infected, the greater the number of those contaminated.

( ) The more infected, the fewer contaminated.

d. In the last seven days represented in the graph, the number of infected with the coronavirus:

( ) Doubled.

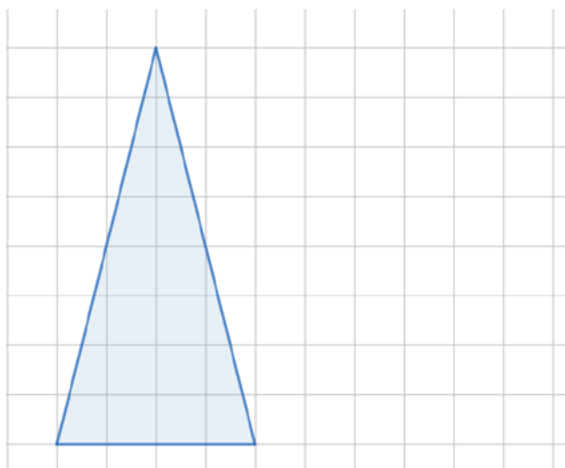
( ) Tripled.

e. When does the treatment coverage curve intercept the number of AIDS deaths in Africa?

## Sequence 3

### Skill 24 – Identify similar figures by recognizing proportionality relationships.

1. The figure in the following grid represents a triangle. Consider the square's size is 1 cm x 1 cm.



Fonte: Equipe Pedagógica

Using the free space in the previous grid, reduce the figure and answer the following questions:

a. What is the measurement of the base of the triangle? Reduce to 2 cm

b. What is the measurement of the height of the triangle? Reduce to 4 cm.

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c. Fill out the following table:

Original Triangle		Reduced Triangle		$\frac{\text{Original base}}{\text{Reduced base}}$	$\frac{\text{Original height}}{\text{Reduced height}}$
Base	Height	Base	Height		

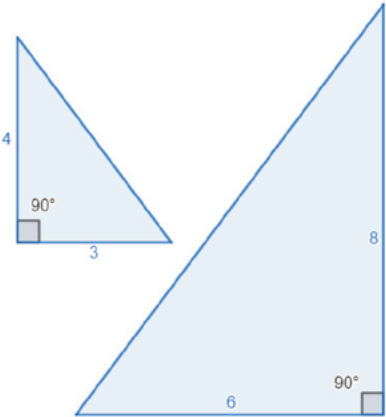
2. Looking at the previous question, we can conclude that

- ( ) The triangle was reduced two times.
- ( ) The triangle was reduced three times.

a. How many times has the triangle been reduced?

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3. Here there are two triangles. Answer the next questions:



Fonte: Equipe pedagógica

a. Can we consider the larger triangle to be twice the size of the smaller triangle?

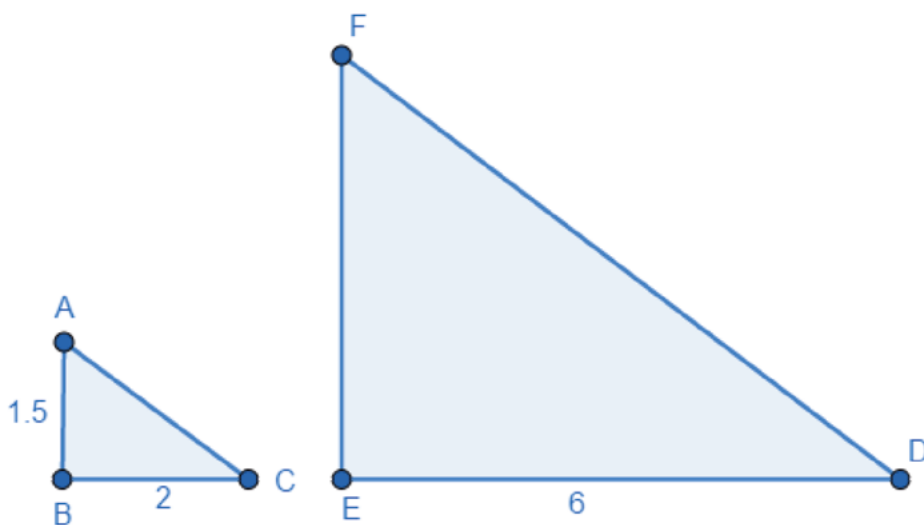
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b. The triangles are similar. Why?

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4. In the figure below, the  $ABC$  and  $EDF$  triangles are similar. Determine the value of the  $\overline{EF}$  side of the  $DEF$  triangle.



Fonte: equipe pedagógica

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5. Knowing that the measurements of the cathetus of a rectangular triangle ABC are 8 cm and 6 cm, and that another rectangular triangle A'B'C', similar to the previous one, has the smallest cathetus measuring 12 cm, what is the area of the rectangular triangle A'B'C'?

Triangle area =  $\frac{\text{Base} \times \text{Height}}{2}$

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