Subject: Mathematics

Number of lessons: 6

Teachers: Laurinda Barros and Luzia Novais

Topic: Equation of a straight Line $y = ax + b$

Key words: khanacademy - GeoGebra - Equation - Straight Line – Slope – Computer - Socrative

Lessons objectives:

It is intended to promote content manipulation involving the equations and respective graphical representation, more precisely:

- Graphical representation of a function, after knowing its equation;
- Study the monotony of a function;
- Find the slope of a line;
- Calculate the intersection of the function graph with the coordinate axes;
- Find "a" and "b";
- Calculate the equation of a straight line.

Resources

- Computers with internet access;
- Multimedia projetos;
- Tablets with internet access;
- Mobile Phones with internet access.

Lessons sequence/activity

- Equation of a straight Line $y = ax + b$ with khan Academy (2 lesson)
- Equation of a straight Line $y = ax + b$ with Geogebra (4 lessons)
- Take a quiz with Socrative (1 lesson)

Web Tools

Khan Academy   https://www.khanacademy.org/
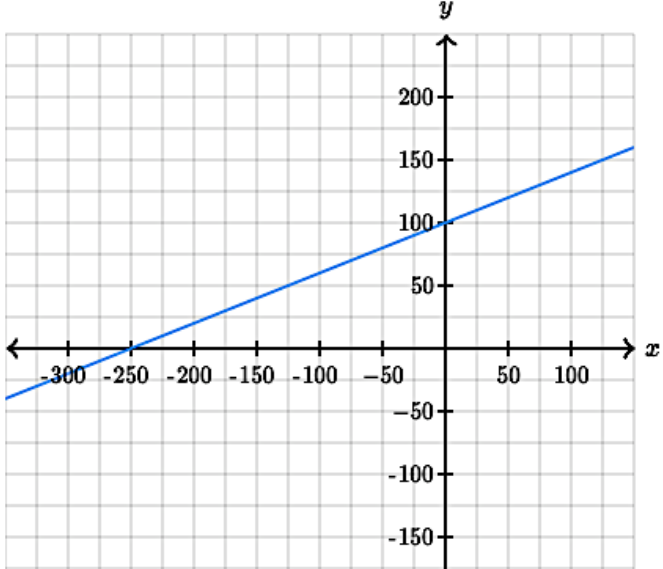
Geogebra   https://www.geogebra.org

socrative   https://socrative.com

1.	**Learn** - what x- and y-intercepts are. The equations used in this video are $y = 0.5x - 3$ and $5x + 6y = 30$. https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-x-and-y-intercepts/v/introduction-to-intercepts
2.	**Pratice -** Intercepts from a graph https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-x-and-y-intercepts/e/linear-function-intercepts Determine the intercepts of the line. x-intercept: $\left(\underline{} , \underline{} \right)$ y-intercept: $\left(\underline{} , \underline{} \right)$
3.	**Learn -** Intercepts from an equation Sal finds the x and y-intercepts of $-5x + 4y = 20$. Created by Sal Khan and Monterey Institute for Technology and Education. https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-x-and-y-intercepts/v/x-and-y-intercepts
4.	**Pratice -** Intercepts from an equation https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-x-and-y-intercepts/v/x-and-y-intercepts Determine the intercepts of the line. $y = 5x - 13$ y-intercept: $\left(\underline{} , \underline{} \right)$ x-intercept: $\left(\underline{} , \underline{} \right)$

5.	**Learn** - Intercepts from a table
	Sal finds the y-intercept of the graph of a linear function given a table of values. Created by Sal Khan.
	https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-x-and-y-intercepts/v/finding-intercepts-for-a-linear-function-from-a-table
6.	**Pratice** - Intercepts from a table
	https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-x-and-y-intercepts/e/intercepts-from-table
	This table gives a few (x, y) pairs of a line in the coordinate plane.
	<table><tr><td>x</td><td>y</td></tr><tr><td>−12</td><td>14</td></tr><tr><td>−2</td><td>21</td></tr><tr><td>8</td><td>28</td></tr></table>
	What is the x-intercept of the line?
	([_____] , [_____])
7.	**Learn** - Graphing using intercepts
	https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-x-and-y-intercepts/v/graphing-using-x-and-y-intercepts

1.	**Learn** - Sal shows how to find the slope of a line. https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-slope/v/introduction-to-slope
2.	**Learn -** Positive & negative slope Sal analyzes what it means for a slope to be positive or negative (spoiler: it affects the direction of the line!). https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-slope/v/positive-and-negative-slope
3.	**Learn -** Worked example: slope from graph The slope of a line is rise over run. Learn how to calculate the slope of the line in a graph by finding the change in y and the change in x. Created by Sal Khan and Monterey Institute for Technology and Education. https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-slope/v/slope-of-a-line-2
4.	**Pratice -** Slope from graph **What is the slope of the line?**
5.	**Learn -** Worked example: slope from two points Find the slope of the line that goes through the ordered pairs (4,2) and (-3, 16). Created by Sal Khan and Monterey Institute for Technology and Education. https://www.khanacademy.org/math/in-in-grade-11-ncert/in-in-class11-straight-lines/copy-of-alg-slope/v/slope-of-a-line-2

| 6.	**Pratice** - Slope from two points
	What is the slope of the line through $(6, 9)$ and $(7, 1)$?
	Choose 1 answer:
	(A) $\dfrac{1}{8}$
	(B) 8
	(C) -8
	(D) $-\dfrac{1}{8}$
7.	**Learn** - Slope (more examples)
	Given two points on a line, you can find the slope of the line. Watch Sal doing a bunch of examples. Created by Sal Khan and CK-12 Foundation.
8.	**Learn** - Slope review
	The slope of a line is a measure of its steepness. Mathematically, slope is calculated as "rise over run" (change in y divided by change in x).
9.	**Learn** - Slope of a horizontal line
	When two points have the same y-value, it means they lie on a horizontal line. The slope of such a line is 0, and you will also find this by using the slope formula. Created by Sal Khan and Monterey Institute for Technology and Education.
10.	**Learn** - Horizontal & vertical lines
	Worked examples identifying the equations and slope of horizontal and vertical lines.
11.	**Pratice** - Horizontal & vertical lines
	What is the equation of the line?
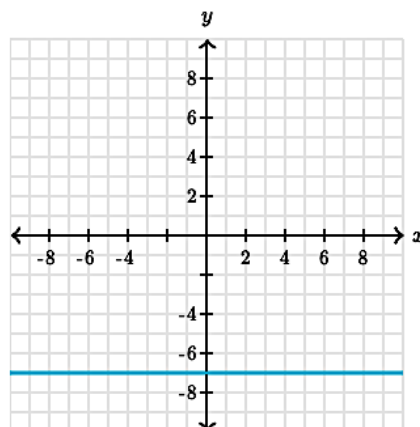
1. Constructs in *Geogebra* the functions graphs:
$$f(x) = 2x, \quad g(x) = -x, \quad h(x) = 10x, \quad i(x) = \frac{1}{2}x, \quad j(x) = -5x \quad e \quad k(x) = 2.$$

1.1. Sketch the graphics:

$f(x) = 2x$	$g(x) = -x$	$h(x) = 10x$
Graph	Graph	Graph

Slope signal: _____

Monotony: _____

Slope signal: _____

Monotony: _____

Slope signal: _____

Monotony: _____

$i(x) = \frac{1}{2}x$	$j(x) = -5x$	$k(x) = 2$
Graph	Graph	Graph

Slope signal: _____

Monotony: _____

Slope signal: _____

Monotony: _____

Slope signal: _____

Monotony: _____

1.2. How does parameter variation a affect Graphs in the family of functions defined by $y = ax$.
- What happens when we increase the absolute value of a?
- What happens when we decrease the absolute value of a?

1.3. What happens to Graph when the real number a is:
- Positive? Negative? Null?

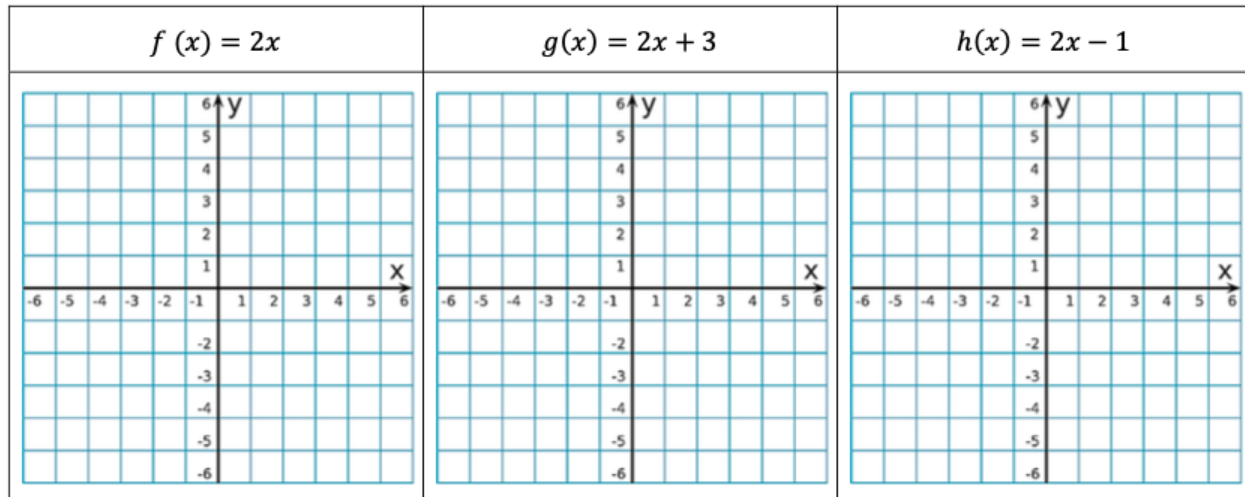**1.** Constructs in *Geogebra* the functions graphs:

$$f(x) = 2x, \quad g(x) = 2x + 3 \text{ e} \quad h(x) = 2x - 1.$$

1.1. Sketch the graphics:

$f(x) = 2x$	$g(x) = 2x + 3$	$h(x) = 2x - 1$

1.2. Complete the following table:

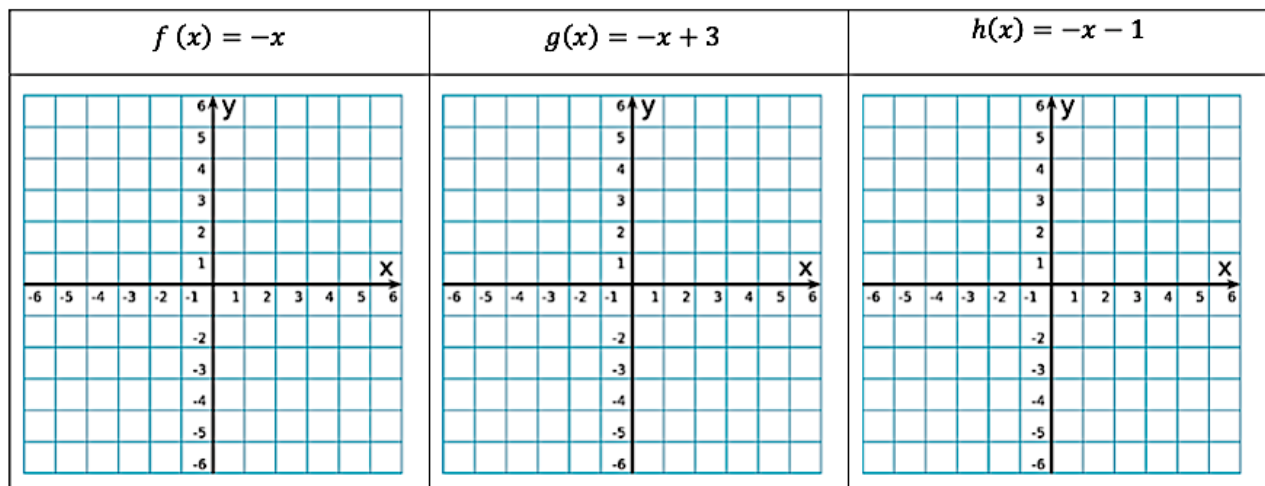|	$f(x) = 2x$	$g(x) = 2x + 3$	$h(x) = 2x - 1$
Slope a:			
y - intercept: b $P(0; b)$			
x - intercept $Q(x, 0)$			
Monotony (ascending / descending)			

1.3. What is the relative position of three straight.

1. Constructs in *Geogebra* the functions graphs:

$$f(x) = -x, \ g(x) = -x + 3 \ e \ h(x) = -x - 1.$$

1.1. Sketch the graphics:

$f(x) = -x$	$g(x) = -x + 3$	$h(x) = -x - 1$

1.2. Complete the following table:

	$f(x) = -x$	$g(x) = -x + 3$	$h(x) = -x - 1$
Slope a:			
y - intercept: b $P(0; b)$			
x - intercept $Q(x, 0)$			
Monotony (ascending / descending)			

1.3. . What is the relative position of three straight.

1.4. How does the variation of parameter b affect the Graphs of the family of functions defined by $y = ax + b$.
   - What happens to the line when we increase the value of b?
   - What happens to the line when we decrease the value of b?

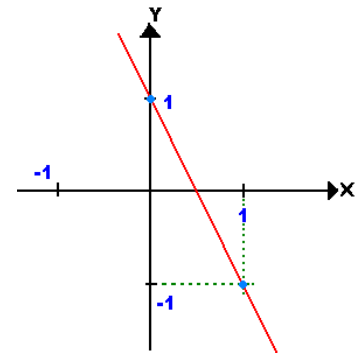socrative

Equation of a Straight Line

1. **For the straight line y = -2x + 3, what are:**
a) the slope
b) the y-intercept?

A) a) Slope = 2
b) y-intercept = (0, -3)

B) a) Slope = -2
b) y-intercept = (0, 3)

C) a) Slope = 3
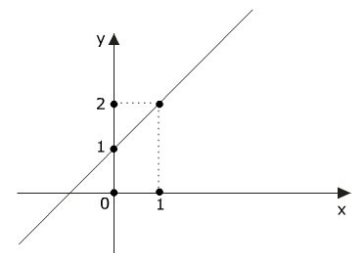b) y-intercept = (0, -2)

D) a) Slope = -3
b) y-intercept = (0, 2)

2. **What is the equation of the straight line shown in the diagram?**

A) y = x - 1

B) y = -x + 1

C) y=2x

D) y=2x+1

3. **What is the equation of the following line?**
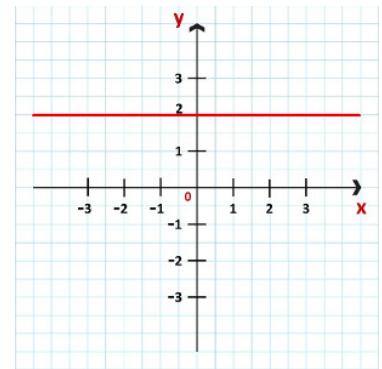
A) y=2x+1

B) y=-x+1

C) y=-2x+1

D) y=0,5x+1

E) y=x+1

4. **For the straight line x = 2y - 3, what are:**
a) the slope
b) the y-intercept?

A) Slope = 2 and y-intercept = (0, -3)

B) Slope = ½ and y-intercept = (0, 1½)

C) Slope = -½ and y-intercept = (0, 1½)

D) Slope = ½ and y-intercept = (0, -1½)

5. **What is the equation of the straight line shown in the diagram?**

(A) x=2

(B) y=2x+2

(C) y=2

(D) y=2x

(E) y=-2x+2

6. **What is the equation of the straight line shown in the diagram?**

(A) y=-2/3x+2

(B) y=2x-2/3

(C) y=x+2

(D) y=3x+2

(E) y=-3x+2