

## PRACTICE 1

### Working with terminology

**Task 1.** Choose 3 terms for each class according to the classification from the theory: general scientific terms; cross-industry terms; industry-specific terms. Give short explanation to each term (ignore the highlighting of some terms)

Linear function, Graph, Point, Coefficient, Slope, Property, Table, Variable, Straight line, Lecture, **Cartesian coordinate system**, Coordinates, Origin of coordinates, x-axis, y-axis, Scale, Equals, Plus, Minus, Positive number, Negative number, Positive direction, Algorithm, Infinity, Domain of definition, Range of function, Greater than, Less than, Greater than or equal to, Less than or equal to, Right, False, Increase, Decrease, Acute angle, Obtuse angle, Right angle, Abscissa, Ordinate, Parallel, Perpendicular, Intersect, **Intersection point**, Plane, Satisfy, Substitute, Coincide, System of equations, General solution, Particular solution, Arbitrary value, Analytical, Graphical, Substitution method, Method of addition, Empty set, Unique solution, **Partial order structure**, **Complex number field**, Graphic editor, Working on the Internet, **Information search**, **Toolbox**, Safety precautions, Laboratory work, Environment, Common, **Computer systems programming**, **Software engineering**, **Network support and management**, **Database design and management**, **System analysis and control**, **Web page design**

<i>general scientific terms</i>	<i>cross-industry terms</i>	<i>industry-specific terms</i>

**Example to the task 1.**

*Mathematics lesson:* A structured educational session where students learn mathematical theories as set of mathematical sentences – definitions, theorems, axioms, and their applications.

*Safety measures:* Precautions and procedures followed to ensure a safe environment, especially during experiments, to prevent accidents and injuries.

*Environment:* The surrounding natural world, including air, water, soil, and living organisms, affecting and being affected by human activities.

**Task 2.** Translate the highlighted terms from task 1. What can they be called? Explain the features of their translation. Make 2 sentences using selected terms.

**Task 3.** Fill in the gaps in the text

#### **Linear function**

**Introduction.** The theme is called Linear function. The linear function is used in the different sections of mathematics and other natural sciences.

**Body.** The standard form of the linear function is  $y = ak + b$ , where  $a, b, k \in R$ . The graph of the linear function is the \_\_\_\_\_,  $k$  is called the \_\_\_\_\_ of the straight line. As is known, the straight line can be constructed using two points.

For example, draw the graph of the function  $y = 2x - 3$ . In order to obtain the \_\_\_\_\_ of two points we are going to use the table.

x	0	1
y	-3	-1

In order to fill the table we take any value of  $x$  and evaluate the corresponding value of  $y$  using the formula  $y = 2x - 3$ . Now we have coordinates of two points  $A(0, -3)$  and  $B(1, -1)$ . Let us draw Cartesian coordinate system. It consists of origin of coordinates, two \_\_\_\_\_ axes:  $x$ -axis and  $y$ -axis with the indicated positive directions of these \_\_\_\_\_. We mark the obtained points  $A(0, -3)$  and  $B(1, -1)$  on the Cartesian coordinate system and construct the straight line through these points.

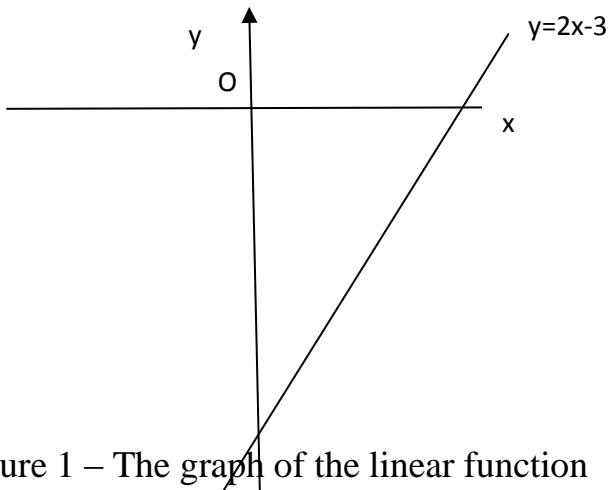


Figure 1 – The graph of the linear function

Let us consider the main \_\_\_\_\_ of the linear function.

Properties:

1. The domain of definition:  $x \in (-\infty, +\infty)$ .
2. The range of function  $y \in (-\infty, +\infty)$ .
3. If  $k > 0$ , then the function \_\_\_\_\_. The \_\_\_\_\_ between the straight line and  $x$ -axis is \_\_\_\_\_ angle. If  $k < 0$ , then the function \_\_\_\_\_. The angle between the straight line and  $x$ -axis is \_\_\_\_\_.

Let us consider the examples.

1. Does the point  $A(7, 2)$  belongs to the graph of the function  $y = 2x - 3$ ?

Solution.

In order to answer this question it is necessary to substitute the coordinates of the point  $A$  into the \_\_\_\_\_  $y = 2x - 3$ . We obtain  $2 = 2 \cdot 7 - 3$ . This

equality is \_\_\_\_\_, hence, point  $A$  does not belong to the graph of the function  $y = 2x - 3$ .

2. Find such point on the straight-line  $y = 2x - 3$ :

- abscissa of which is equal to 7;
- ordinate of which is equal to 5.

Solution.

In order to find \_\_\_\_\_ of the point it is necessary to substitute 7 instead of  $x$  into the function  $y = 2x - 3$ . After the substitution we have  $y = 2 \cdot 7 - 3 = 11$ .

In order to find \_\_\_\_\_ of the point it is necessary to substitute 5 instead of  $y$  into the function  $y = 2x - 3$ . After the \_\_\_\_\_ we have  $5 = 2 \cdot x - 3$ .

From here  $x = \frac{5+3}{2} = 4$ . Finally we obtain two points  $K(7,11)$ ,  $L(4,5)$ .

Let us consider two \_\_\_\_\_  $y = k_1x + b_1$  and  $y = k_2x + b_2$ . As we have already mentioned above  $k$  is called the\_\_\_\_\_.

If  $k_1 = k_2$  then the straight-lines are parallel. If  $k_1 \neq k_2$  then the straight-lines intersect.

3. Find the point of intersection of the straight lines  $y = 2x - 3$  and  $y = -3x + 2$ .

Solution.

The point of intersection is the \_\_\_\_\_ point, hence, we are going to solve the following \_\_\_\_\_  $\begin{cases} y = 2x - 3 \\ y = -3x + 2 \end{cases}$ . Let us equate the left-hand sides of the equations  $2x - 3 = -3x + 2$ . From here we have  $x = 1$ . Then we substitute  $x = 1$  into the first \_\_\_\_\_ and obtain  $y = -1$ . Hence, we obtain the point of \_\_\_\_\_  $P(1,-1)$ .

**Conclusions.** In this report we have considered the basic data, related to the theme Linear functions, the main properties and the solutions of the simplest problems.

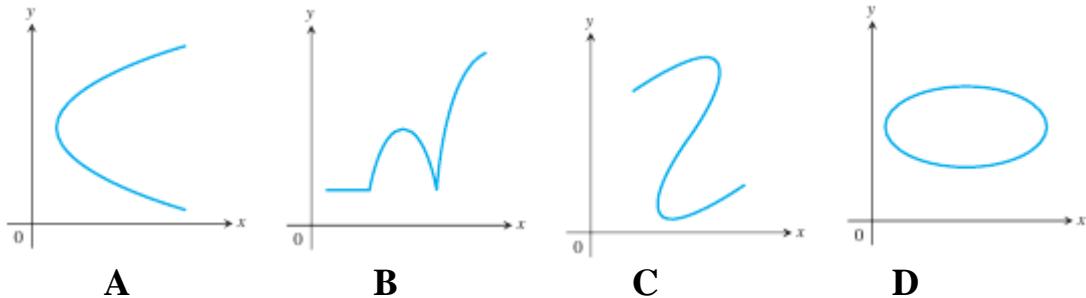
#### Glossary:

linear function – лінійна функція;  
standard form – загальний вигляд;  
slop – кутовий коефіцієнт;  
graph – графік;  
straight line – пряма;  
point – точка;  
right angle – прямий кут;  
acute angle – гострий кут;  
obtuse angle – тупий кут;  
to increase – зростати;  
to decrease – спадати;  
Cartesian coordinate system – декартова система координат

origin of coordinates – початок координат;  
point of intersection – точка перетину;  
to substitute – підставляти;  
equation – рівняння;  
parallel – паралельний;  
abscissa – абсцисса;  
ordinate – ордината;  
equality – рівність;  
domain of definition – область визначення;  
range of function – область значення

## Homework 1

**Task 1.** Which of the graphs are graphs of function of  $x$ , and which are not. Give reasons for your answers



**Task 2.** Graph the function  $f(x) = x^3 - 7x^2 + 28$  in each of the following display or viewing windows:

(a)  $[-10, 10]$  by  $[-10, 10]$  (b)  $[-4, 4]$  by  $[-50, 10]$  (c)  $[-4, 10]$  by  $[-60, 60]$

Select a window that gives a clear picture of a graph. Give your arguments.

**Task 3.** Write a report (up to 10 minutes) on the given topic (according to your specialty). Follow the general structure of the report. See the example from task 3.

- Лінійні рівняння з двома змінними.
- Квадратичні нерівності з однією змінною.
- Системи лінійних нерівностей з однією змінною.
- Дробово-лінійні нерівності.
- Метод інтервалів.
- Формули скороченого множення.
- Квадратична функція.
- Різні методи розв'язання квадратних рівнянь.
- Побудова графіків функцій від однієї змінної за допомогою програмного забезпечення.
- Побудова двовимірних поверхонь за допомогою програмного забезпечення.
- Відкриття видатних вчених-фізиців.
- Видатні вчені про штучний інтелект.
- Найвидатніші відкриття 20 століття.
- Приклади візуалізації процесу розв'язання рівнянь та нерівностей.
- Вимоги до оформлення математичного тексту в редакторі Word.
- Методика викладання теми “Основні елементи інтерфейсу Windows”.
- Методика викладання теми “Правила роботи в комп’ютерному класі”.

☒ **Task 4.** Read the text «*Solution by Cramer's rule*» using the following link. Classify the terms according to the classification from the theory.

[https://uomus.edu.iq/img/lectures21/MUCLecture\\_2024\\_4519375.pdf](https://uomus.edu.iq/img/lectures21/MUCLecture_2024_4519375.pdf)

☒ **Task 5. Follow the example**

Function	Domain (x)	Range (y)
1) $y = 1/x$	$(-\infty, 0) \cup (0, \infty)$	$(-\infty, 0) \cup (0, \infty)$
2) $y = x^2$		
3) $y = \sqrt{4 - x}$		
4) $y = \sqrt{1 - x^2}$		

1)

The formula  $y = 1/x$  gives a real y-value for every  $x$  except  $x = 0$ . For consistency in the rules of arithmetic, we *cannot divide any number by zero*. The range of  $y = 1/x$ , the set of reciprocals of all nonzero real numbers, is the set of all nonzero real numbers, since  $y = 1/(1/y)$ . That is, for  $y \neq 0$  the number  $x = 1/y$  is the input assigned to the output value  $y$ .