

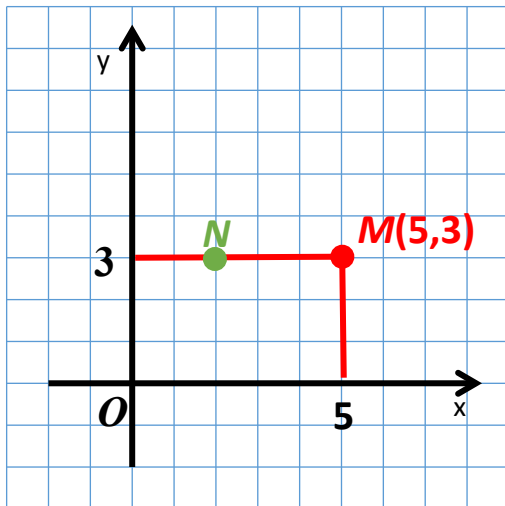
MATH 6: ASSIGNMENT 17. CARTESIAN PLANE and COORDINATES

Coordinates, linear function

February 25, 2024

This week we discussed how one can introduce coordinates in a plane, so that every point is described by a pair of numbers. To do this, we need to choose:

- The origin (usually denoted O)
- Unit length
- Two perpendicular axes (usually called x and y)



For point $M(5,3)$, the x -coordinate is 5, the y -coordinate is 3. Order matters:

$$x_M = 5,$$

$$y_M = 3$$

To find the distance along x between two points, at the same y , you need to subtract their x -coordinates and take the absolute value: The size of MN or distance is:

$$MN(x) = |x_M - x_N|$$

$$MN(x) = |5 - 2| = 3$$

In this case, similarly: the distance along y is:

$$MN(y) = |y_M - y_N|$$

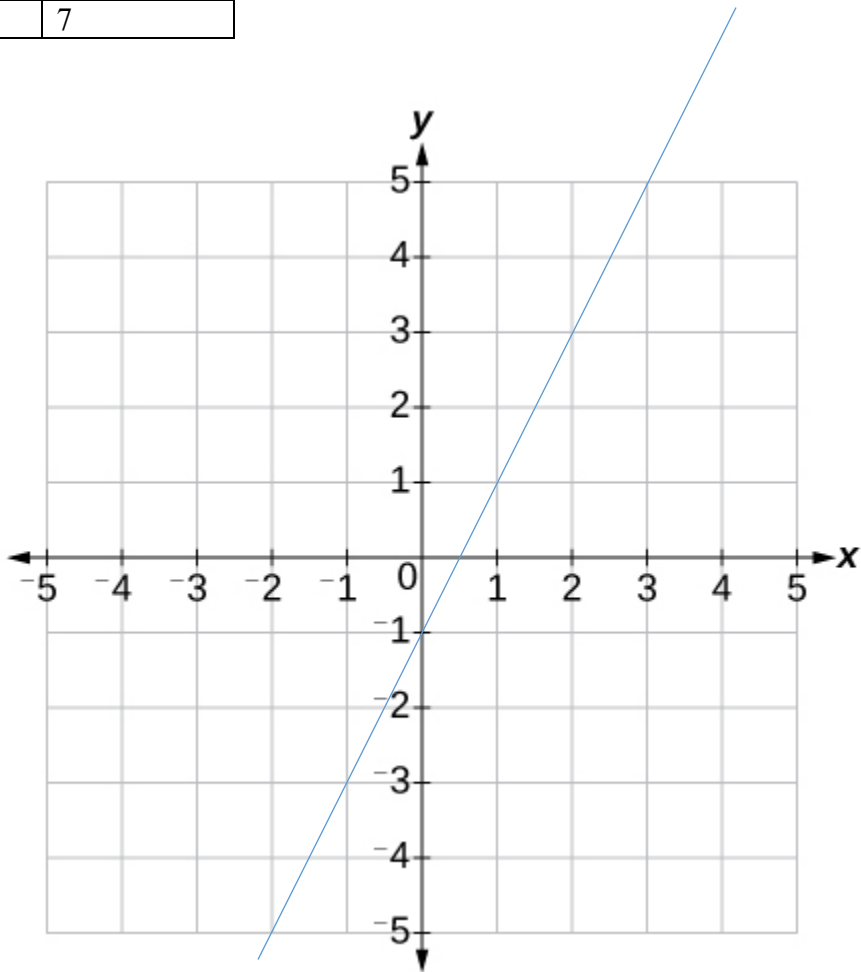
$$MN(y) = |3 - 3| = 0$$

Function $y = f(x)$:

- For every x there is a y or
- $\forall x \exists y$

$y = kx + b$ is called linear function because y changes linearly, e.g. proportionally to x .

x	$y = 2x - 1$
0	-1
1	1
2	3
3	5
4	7



Homework

1. Point B is 5 units above and 2 units to the left of $A(7,5)$. What are the coordinates of point B ?
2. Plot on the coordinate plane the following, and connect each dot to the next one. If you did everything correctly, you will get a picture...
(0,2); (0,0); (1,3); (2,3); (3,2); (3,0); (1,-1); (2,-1); (1,-3); (0,-1);
(-1,-3); (-2,-1); (-1,-1); (-3,0); (-3,2); (-2,3); (-1,3); (0,0).
3. Find the coordinates of the midpoint of the segment AB , where $A=(3,11)$ and $B=(7,5)$
4. Draw points $A(4,1)$, $B(3,5)$, $C(-1,4)$. If you did everything correctly, you will have 3 vertices of a square. What are the coordinates of the fourth vertex? What is the area of the square?
5. Find the missing coordinates:
 - (a) 3 points $A(0,0)$, $B(1,3)$, $D(5,-2)$ are vertices of a parallelogram $ABCD$. What are the coordinates of C ?
 - (b) 3 points $A(0,0)$, $B(2,3)$, $D(4,1)$ are vertices of a parallelogram $ABCD$. What are the coordinates of C ?
 - (c) 3 points $A(0,0)$, $B(1,5)$, $D(3,-2)$ are vertices of a parallelogram $ABCD$. What are the coordinates of C ?
 - (d) Can you guess the general rule: if $A(0,0)$, $B(b_1,b_2)$, $D(d_1,d_2)$ are vertices of a parallelogram $ABCD$. What are the coordinates of C ?
6. Point M has coordinates $(5,7)$
 - (a) Find the coordinates of the point M_I obtained from M by reflection about the x -axis.
 - (b) Find the coordinates of the point M_I obtained from M by reflection about the y -axis.
 - (c) Find the coordinates of the point M_I obtained from M by reflection about the diagonal line $x=y$.
7. Draw the following linear functions on the same graph:
 - a. $y = x$
 - b. $y = 3x$
 - c. $y = \frac{1}{3}x$
8. Draw the following linear functions on the same graph:
 - a. $y = 2x$
 - b. $y = 2x + 3$
 - c. $y = 2x - 3$