



Unit 6: Lesson 05

Finding function rules given points in a chart Special cases of linear functions (vert., horiz., $b = 0$)

Consider the case of being given several points on a line (we must be given at least two) and then finding the equation, $y = mx + b$, that produces the line that passes through the given points:

- Use any two of the points to produce the slope with the slope formula.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

- Substitute this slope, and any point, for example, (x_1, y_1) into $y = mx + b$.
- This produces the equation $y_1 = mx_1 + b$ where only b is unknown. Solve for b .
- Use the m and b just produced to write the final equation of the line.

Example 1: All of the points in this chart lie on the same line. What is the equation of the line?

x	y
0	5
1	8
4	17
6	23

$$(x_1, y_1) = (0, 5) \quad (x_2, y_2) = (1, 8)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 5}{1 - 0} = \frac{3}{1}$$

$$= 3$$

$$y = mx + b$$

$$y = 3x + b$$

$$5 = 3(0) + b$$

$$5 = b$$

sub in $(0, 5)$ [or any other pt]

$$y = mx + b$$

$$y = 3x + 5$$

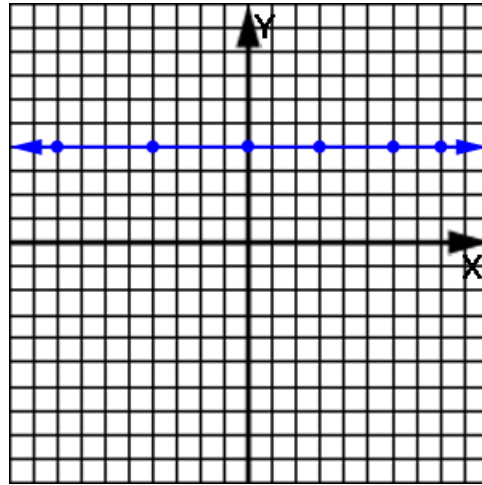
Example 2: Consider graphing the linear function $y = mx + b$ where $m = 0$ and $b = 4$. Write the equation and simplify. Then fill in the chart below with several x values between -10 and 10 , plot the points, and then connect with a line. How would you describe the graphed line?

$$y = mx + b$$

$$y = 0x + 4$$

$$y = 4$$

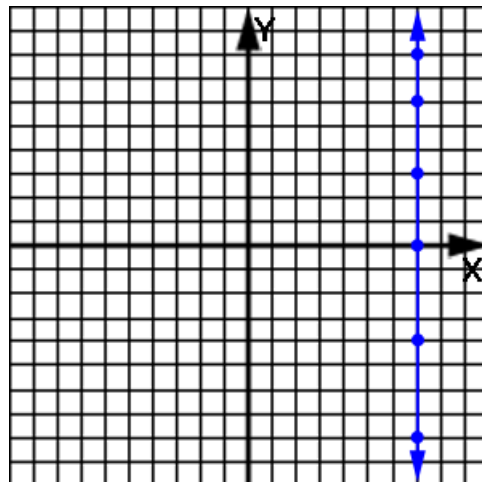
x	$y = 4$
-8	4
-4	4
0	4
3	4
6	4
8	4



It's a horizontal line.

Example 3: Consider graphing a linear relation in which the y term is missing: for example, $x = 7$. Fill in the chart below in which we let y be the independent variable with several values between -10 and 10 , plot the points, and then connect with a line. How would you describe the graphed line?

$x = 7$	y
7	-8
7	-4
7	0
7	3
7	6
7	8



It's a vertical line.

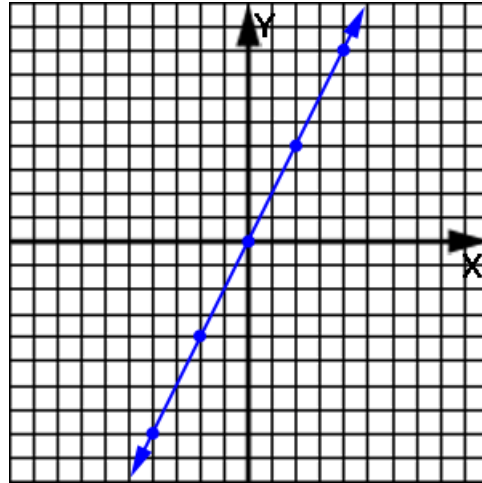
Example 4: Consider the graph of $y = mx + b$ when b is zero: for example, $y = 2x + 0$. Simplify this equation. Then fill in the chart below with several x values between -4 and 4 , plot the points, and then connect with a line. Comment on any special thing you notice about the line.

$$y = mx + b$$

$$y = 2x + 0$$

$$y = 2x$$

x	$y = 2x$
-4	-8
-2	-4
0	0
2	4
4	8



The line passes through the origin.

Summary of the last three examples:

An equation of the form $y = \text{"a constant"}$

for example, $y = 4$, graphs as a **horizontal line**.

An equation of the form $x = \text{"a constant"}$

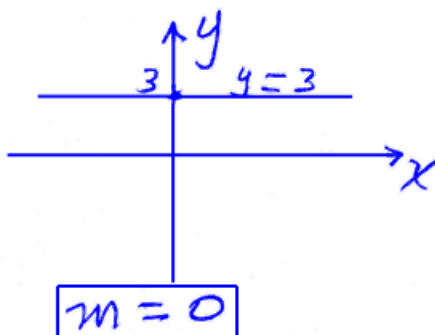
for example, $x = 7$, graphs as a **vertical line**.

An equation of the form $y = mx$ (notice b is missing: it's 0)

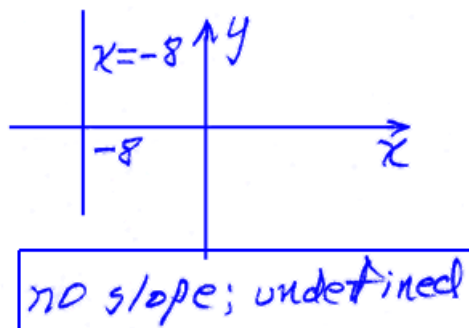
for example, $y = 2x$, passes **through the origin**.



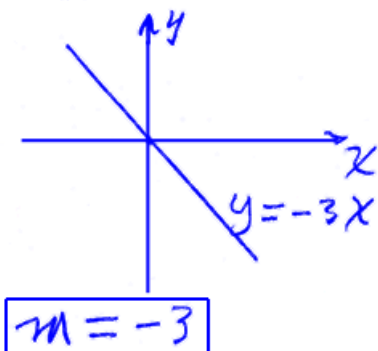
Example 5: Make a sketch of $y = 3$.
What is its slope?



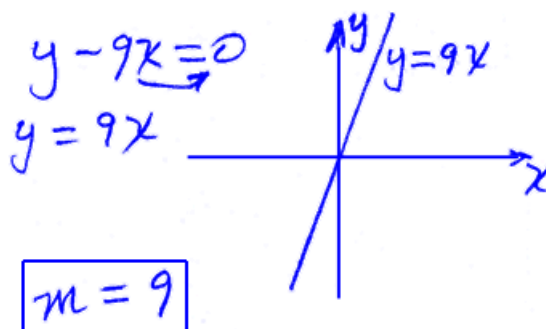
Example 6: Make a sketch of $x = -8$.
What is its slope?



Example 7: Make a sketch of $y = -3x$.
What is its slope?



Example 8: Make a sketch of $y - 9x = 0$.
What is its slope?



Assignment:

1. All of the points in this chart lie on the same line. What is the equation of the line?

x	y
-1	2
5	-4
6	-5
10	-9

2. All of the points in this chart lie on the same line. What is the equation of the line?

x	y
-4	14
-1	8
4	-2
8	-10

3. All of the points in this chart lie on the same line. What is the equation of the line?

x	y
20	-20
30	-30
40	-40
100	-100

4. Sketch $y = -2$. What is its slope?

5. Sketch $f(x) = 12$. What is its slope?

6. Sketch $y = -4x$. What is its slope?

7. Sketch $f(x) = 5x$. What is its slope?

8. Sketch $x = 2$. What is its slope?

9. Sketch $x + 9 = 0$. What is its slope?

10. Sketch $y - 4x = 0$. What is its slope?

11. Sketch $y - 6 = 0$. What is its slope?

12. Sketch and label both $y = 6$ and $x = -5$ on the same coordinate system.

13. Sketch and label both $y + 2 = 0$ and $7 - x = 0$ on the same coordinate system.

14. Sketch and label both $y = 3x$ and $y - 6x = 0$ on the same coordinate system. Which has the steepest slope?