Ch3. *Functions via Graphs*
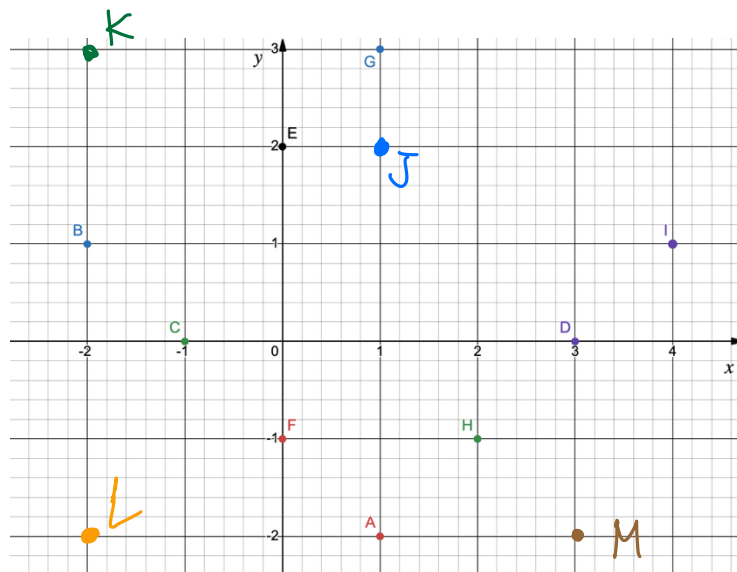
1. The definition of a Relation:

A __relation__ is any set of __ordered__ pairs. The set of all first components of the ordered pair is called the __domain__ of the relation and the set of all second components is called the __range__ of the relation.

2. Write down the ordered pair points in the given coordinate:

A: (1 , -2); B: (-2, 1); C: (-1 , 0);

D: (3 , 0); E: (0 , 2); F: (0 , -1);

G: (1 , 3); H: (2 , -1); I : (4 , 1).

3. Plot the given points in a rectangular coordinate:

J:(1, 2); K:(-2, 3); L:(-2, -2); M:(3, -2).

4. From a relation to a function:

__Each element in domain only gets One element from range__.

5. Linear Functions and the Slopes:

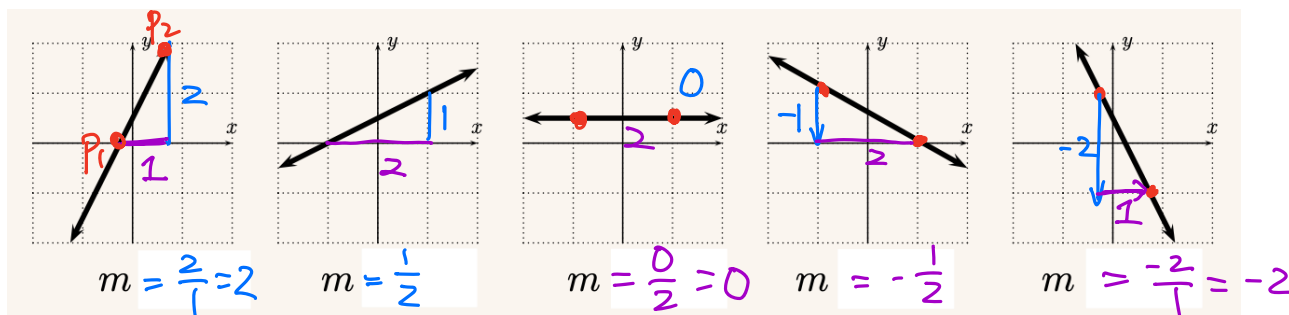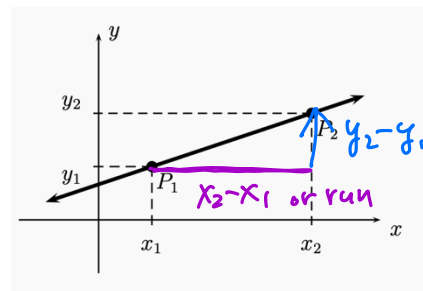A __linear__ function is a function of the form

$$f(x) = m \cdot x + b$$

where m is the __slope__ of the line and $(0, b)$ is __y-intercept__ of the line. The domain of a line is __All Real Number, $\mathbb{R}$, $(-\infty, \infty)$__

6. The slope and its sign:

Given two points of a line $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$. Then the slope m is

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \left(\frac{rise}{run}\right)$$

$y_2 - y_1$

$x_2 - x_1$ or run

$$m = \frac{2}{1} = 2 \qquad m = \frac{1}{2} \qquad m = \frac{0}{2} = 0 \qquad m = -\frac{1}{2} \qquad m = \frac{-2}{1} = -2$$

7. Find the equation of the line by the given information:

(1) $m = 2$ and y-intercept is $(0, -1)$

$$f(x) = 2 \cdot x - 1$$

(2) the line passes $(1,1)$ and $(-1,-3)$

P_1 P_2

$$m = \frac{-3-1}{-1-1} = \frac{-4}{-2} = 2$$

$$f(x) = 2 \cdot x + b \Rightarrow f(x) = 2x - 1$$
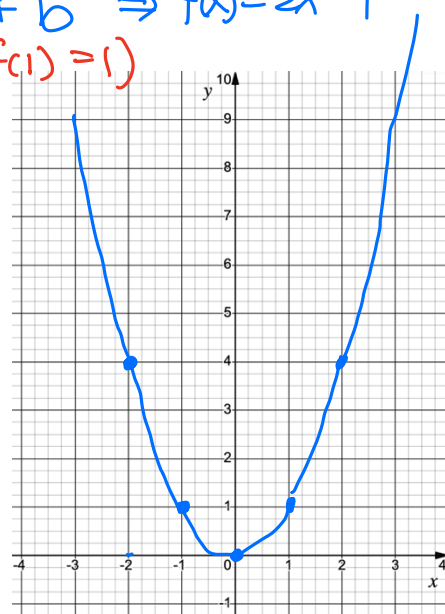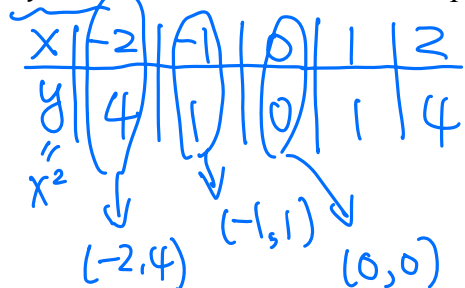
Using P_1 (when $x=1$, $f(1) = 1$)

$$1 = 2 \cdot 1 + b$$

$f(1)$ $\quad 1 = 2 + b$

$\quad \quad \quad -2 \ -2$

$\quad \quad \Rightarrow -1 = b$

8. Functions given by graphs
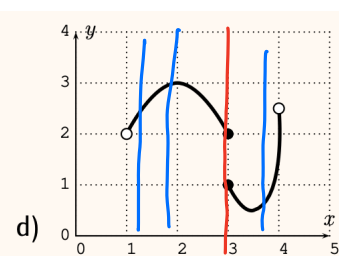
Let $y = x^2$ with domain $D = \mathbb{R}$. Graph this on the given coordinate.

x	-2	-1	0	1	2
y x^2	4	1	0	1	4

$(-2,4)$ $(-1,1)$ $(0,0)$

9. Vertical Line Test:

A graph is the graph of a function precisely when every **Vertical line** intersects the graph **at most once**.

10. Use **Vertical Line Test** to determine which of the following are the graphs of functions.
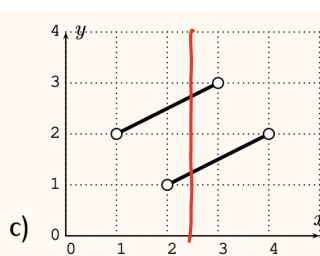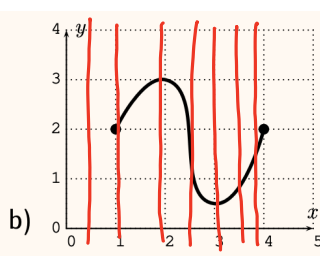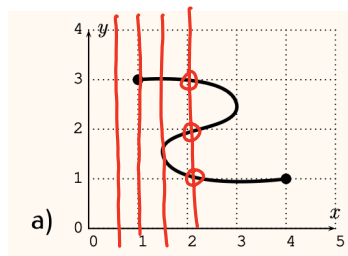
a) **NO, this is NOT a function**

b) **Yes, this is a function**

c) **NO, this is NOT a function**

d) **NO, this is NOT a function**

11. Let f be the function given by the following graph.

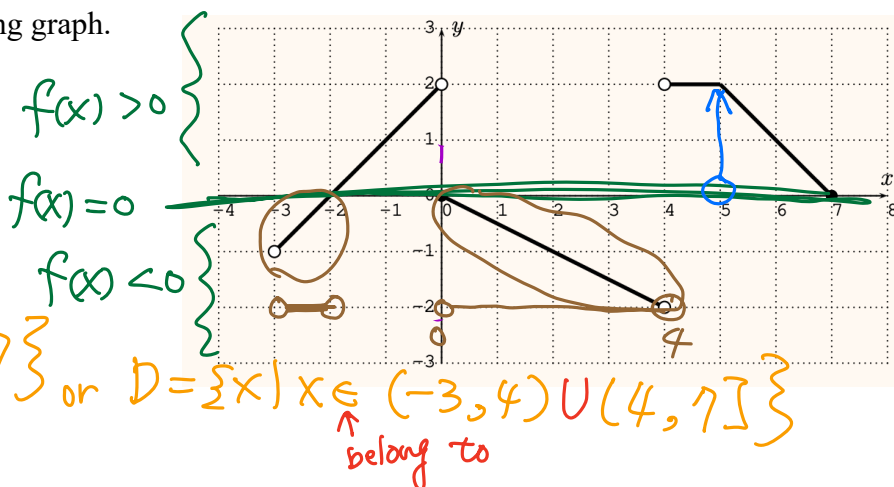(a) What is the domain of f?
(b) What is the range of f?
(c) For which x is $f(x) < 0$?
(d) Find $f(0) + 5$.
(e) Find $f(0 + 5)$.

$f(x) > 0$

$f(x) = 0$

$f(x) < 0$

(a) Domain: possible input

$$D = \{x \mid -3 < x < 4, \ 4 < x \le 7\} \text{ or } D = \{x \mid x \in (-3,4) \cup (4,7]\}$$

↑ belong to

(b) Range: possible output

$$Range = \{y \mid -2 < y \le 2\}$$

(c) $-3 < x < -2$ and $0 < x < 4$

(d) $f(0) + 5 = 0 + 5 = 5$

(e) $f(0+5) = f(5) = 2$