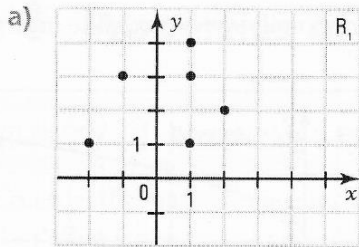
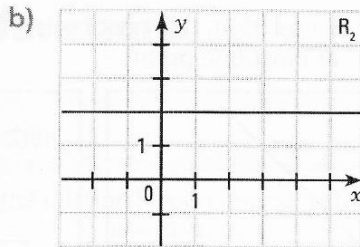


1. A) Yes B) No: c is paired with 0 & 2
 C) Yes D) No: c is paired with 1, 2 & 3

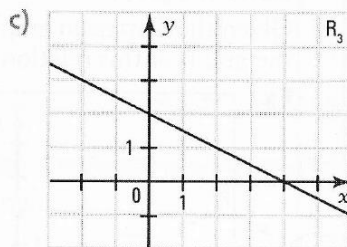
2. Determine if the following relations are functions.



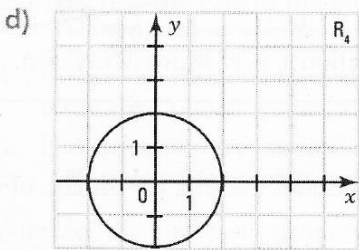
No



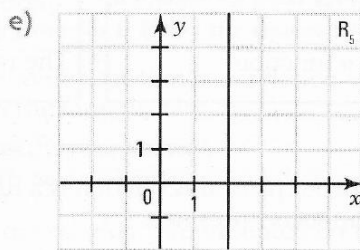
Yes



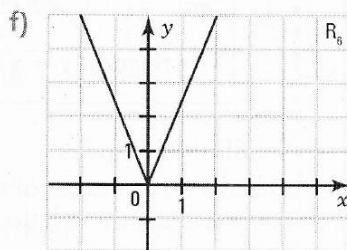
Yes



No



No



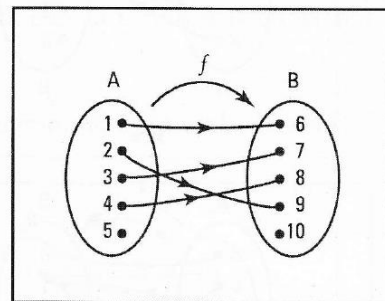
Yes

3. In each of the following cases, determine the relations that are not functions. Justify your answer.

- a) $R_1 = \{(0, a), (2, b), (3, a), (4, b)\}$ Yes
 b) $R_2 = \{(-1, 4), (0, 2), (0, 7), (5, 8)\}$ No, since 0 is in relation with 2 elements: 2 and 7.
 c) $R_3 = \{(5, 8), (6, 8), (7, 8), (8, 8)\}$ Yes
 d) $R_4 = \{(4, -2), (1, -1), (0, 0), (1, 1)\}$ No, since 1 is in relation with 2 elements: -1 and 1.

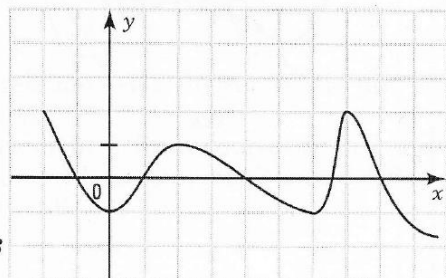
4. True or false?

- a) 7 is the image of 3 by f . True
 b) 2 is the image of 9 by f . False
 c) $f(1) = 6$. True
 d) $f(8) = 4$. False
 e) $f(2)$ is undefined. False
 f) The image of 5 by f does not exist. True



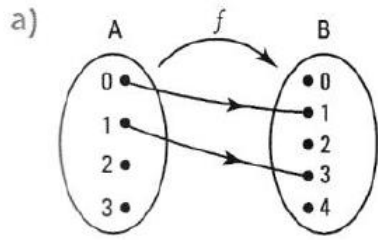
5. Consider the function represented on the right.

- a) Determine
 1. $f(2) = 1$ 2. $f(6) = -1$
 3. $f(0) = -1$ 4. $f(-2) = 2$
 5. $f(1) = 0$ 6. $f(4) = 0$



- b) What are the antecedents of
 1. 2. -2 and 7 2. 0. -1; 1; 4; 6.5 and 8
 3. -1. 0.6 and 8.5 4. 3. None

6. Détermine le domaine et l'image des fonctions suivantes.



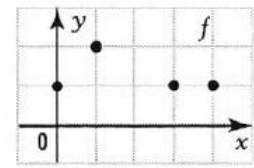
$$\text{dom } f = \{0, 1\}$$

$$\text{ima } f = \{1, 3\}$$

b) $f = \{(1, 2), (2, 4), (3, 6), (4, 8)\}$ c)

$$\text{dom } f = \{1, 2, 3, 4\}$$

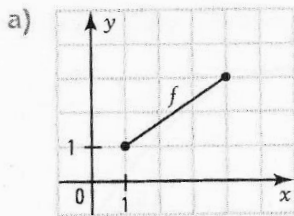
$$\text{ima } f = \{2, 4, 6, 8\}$$



$$\text{dom } f = \{0, 1, 3, 4\}$$

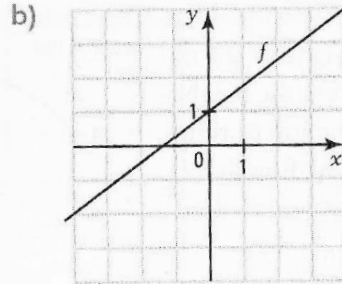
$$\text{ima } f = \{1, 2\}$$

7. Determine the domain and range of the following functions.



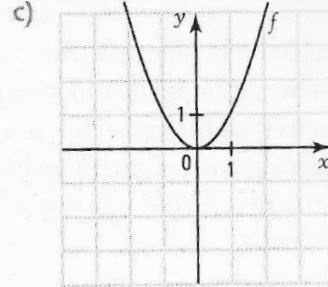
$\text{dom } f = [1, 4]$

$\text{ran } f = [1, 3]$



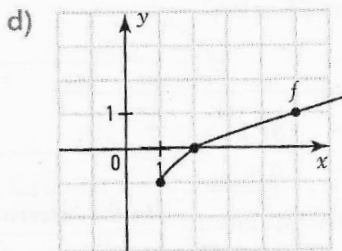
$\text{dom } f = \mathbb{R}$

$\text{ran } f = \mathbb{R}$



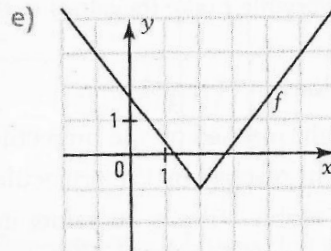
$\text{dom } f = \mathbb{R}$

$\text{ran } f = \mathbb{R}_+$



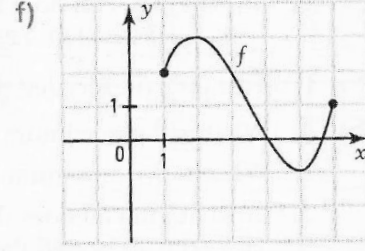
$\text{dom } f = [1, +\infty[$

$\text{ran } f = [-1, +\infty[$



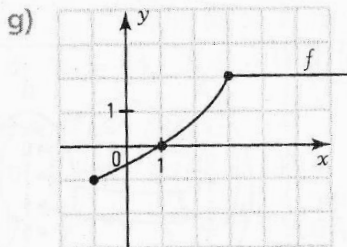
$\text{dom } f = \mathbb{R}$

$\text{ran } f = [-1, +\infty[$



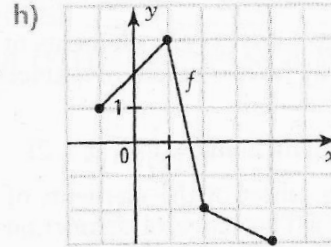
$\text{dom } f = [1, 6]$

$\text{ran } f = [-1, 3]$



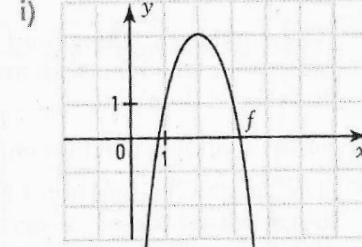
$\text{dom } f = [-1, +\infty[$

$\text{ran } f = [-1, 2]$



$\text{dom } f = [-1, 4]$

$\text{ran } f = [-3, 3]$



$\text{dom } f = \mathbb{R}$

$\text{ran } f =]-\infty, 3]$

8. For each of the following functions, determine for which values of x the function f is defined and deduce the domain of the function.

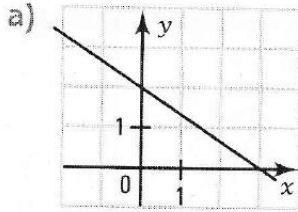
a) $f(x) = x^2 + 5$ For any value of x , $\text{dom } f = \mathbb{R}$.

b) $f(x) = \frac{1}{x-2}$ For any value of x different from 2, $\text{dom } f = \mathbb{R} \setminus \{2\}$.

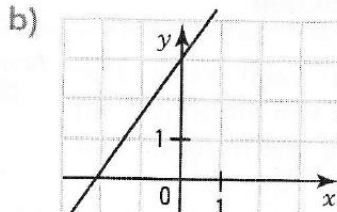
c) $f(x) = 3\sqrt{x-5}$ $x - 5 \geq 0, x \geq 5, \text{dom } f = [5, +\infty[$.

d) $f(x) = -3x + 7$ For any value of x , $\text{dom } f = \mathbb{R}$.

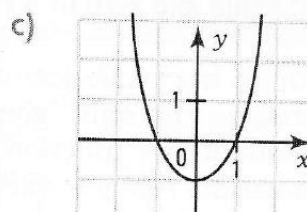
9. Determine the zero(s) and the initial value of the following functions.



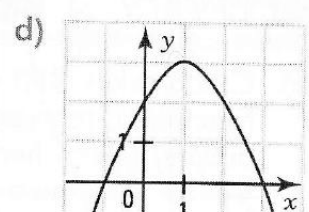
zero: 3
initial value: 2



zero: -2
initial value: 3



zeros: -1 and 1
initial value: -1

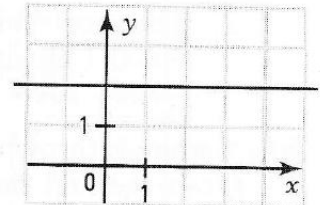


zeros: -1 and 3
initial value: 2

10. The function f on the right is represented by a horizontal line.

a) What can we say about the zeros of this function? Justify your answer.

The zeros do not exist, because the graph will never intersect the x-axis since the line is parallel to the x-axis.

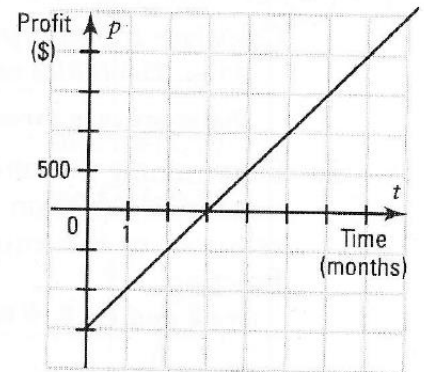


b) What is the initial value of the function? 2

11. The graph on the right represents a function f which gives the profit p made by a company as a function of time t (in months) since its opening.

a) What is the zero of this function? What does it represent?
3; it represents the number of months since opening for the profit to be zero.

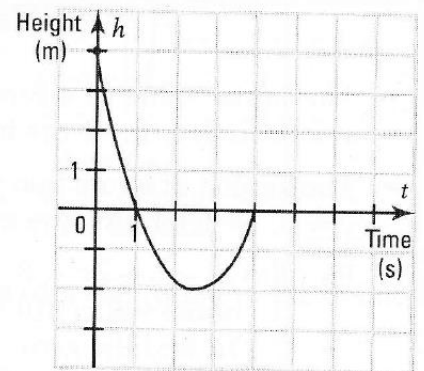
b) What is the initial value of this function? What does it represent?
-1500; it represents the company's profit at its opening.



12. The graph on the right represents a function f which gives the height h reached by a diver (in m) as a function of time t (in seconds).

a) What are the zeros of this function? What do they represent?
1 s and 4 s. They represent the time at which the diver was at the surface of the water.

b) What is the initial value of this function? What does it represent?
4 m. It represents the height from which the diver jumped.



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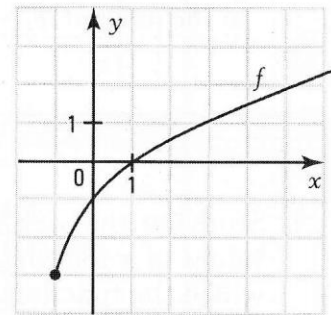
13. a) Pos: $]-\infty, 2]$ b) Pos: $]-\infty, -1]$ c) Pos: \mathbb{R}
 Neg: $[2, +\infty[$ Neg: $[-1, +\infty[$

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13. d) Pos: $[-\infty, 1] \cup [3, +\infty]$ e) Pos: $[1, +\infty[$ f) Pos: $[-3, 1] \cup [3, +\infty]$
 Neg: $[1, 3]$ Neg: $]-\infty, 1]$ Dec: $[-\infty, -3] \cup [1, 3]$

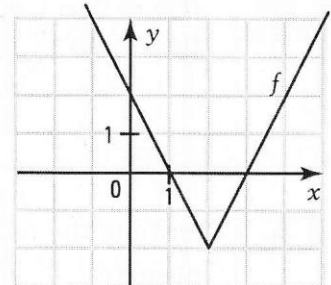
14. Consider the function f represented on the right.

- a) What is the domain of f ? $[-1, +\infty[$
 b) What is the range of f ? $[-3, +\infty[$
 c) What is the zero of f ? 1
 d) What is the initial value of f ? -1
 e) Find the interval for which the function f is
 1. positive. $[1, +\infty[$
 2. strictly negative. $[-1, 1[$



15. Consider the function f represented on the right.

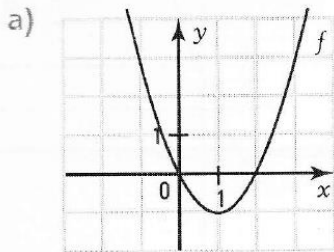
- a) What is the domain of f ? \mathbb{R}
 b) What is the range of f ? $[-2, +\infty[$
 c) What is (are) the zero(s) of f ? 1 and 3
 d) What is the initial value of f ? 2
 e) Find the interval for which the function f is
 1. strictly positive. $]-\infty, 1[\cup]3, +\infty[$
 2. negative. $[1, 3]$



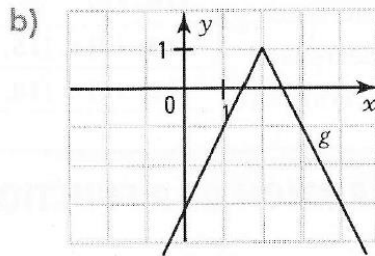
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16. a) Increasing: $[0, 2] \cup [4, 7]$
 b) Decreasing: $[-2, 0] \cup [2, 4]$

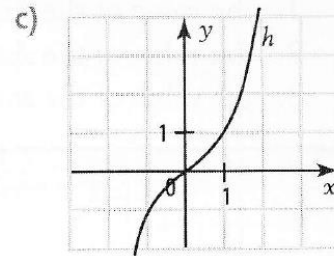
17. Give the increasing and decreasing intervals of the following functions.



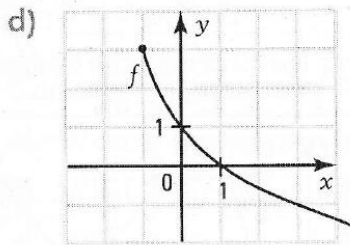
f is decreasing over $]-\infty, 1]$.
 f is increasing over $[1, +\infty[$.



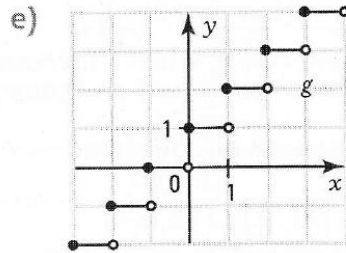
g is increasing over $]-\infty, 2]$.
 g is decreasing over $[2, +\infty[$.



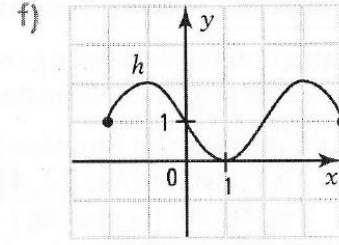
h is increasing over \mathbb{R} .
 h is never decreasing.



f is never increasing.
 f is decreasing over $[-1, +\infty[$.

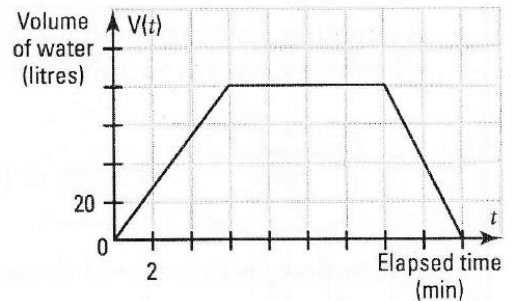


g is increasing over \mathbb{R} .
 g is never decreasing.



h is increasing over $[-2, -1] \cup [1, 3]$.
 h is decreasing over $[-1, 1] \cup [3, 4]$.

18. Raphael has taken a bath. The graph on the right illustrates the variation of the volume of water in the bath from the moment he turned on the faucet.



a) Indicate and interpret the interval where the function V is strictly increasing.

$[0, 6]$. From 0 to 6 minutes, Raphael is filling his bath.

b) Indicate and interpret the interval where the function V is constant.

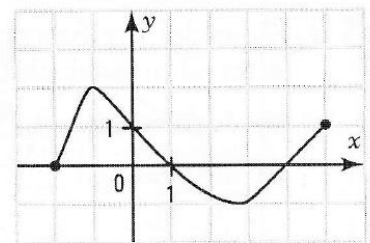
$[6, 14]$. It is over this interval of time, lasting 8 minutes, that Raphael bathed.

c) Indicate and interpret the interval of time where the function V is strictly decreasing.

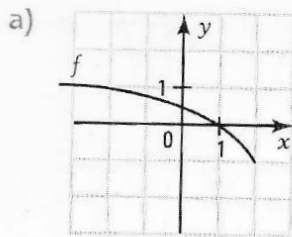
$[14, 18]$. It is over this interval of time, lasting 4 minutes, that Raphael emptied his bath.

19. Draw the graph of a function f that satisfies the following conditions.

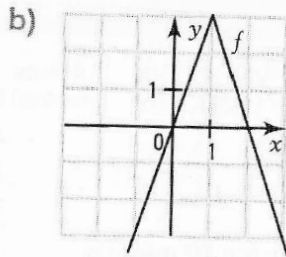
1. $f \geq 0$ in $[-2, 1] \cup [4, 5]$.
2. $f \leq 0$ in $[1, 4]$.
3. $f \nearrow$ in $[-2, -1] \cup [3, 5]$.
4. $f \searrow$ in $[-1, 3]$.



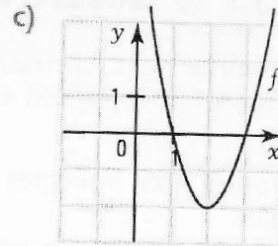
20. Determine, when they exist, the maximum and minimum of the following functions.



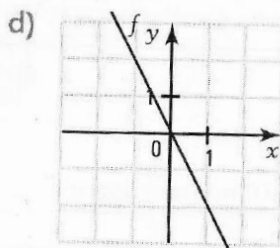
$\min f = -1$



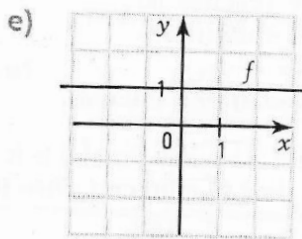
$\max f = 3$



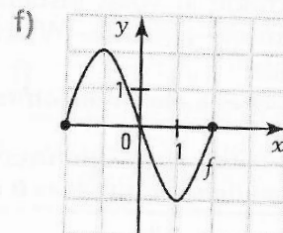
$\min f = -2$



no extrema



$\max f = 1, \min f = 1$



$\max f = 2, \min f = -2$

21. Given the function on the right.

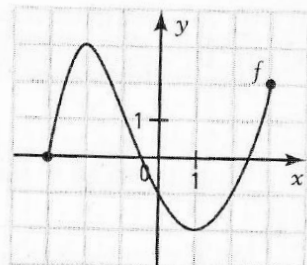
a) Determine

1. $\text{dom } f$ $[-3, 3]$ 2. $\text{ran } f$ $[-2, 3]$

b) For what value of x does the function reach its absolute maximum? What is this absolute maximum?

The absolute maximum of f is 3 when $x = -2$.

c) For what value of x does the function reach its absolute minimum? What is this absolute minimum? **The absolute minimum of f is -2 when $x = 1$.**



22. The graph on the right illustrates the profit $P(x)$ (in \$) generated from selling x video cameras in one week. This company cannot produce more than 80 cameras per week.

a) Determine

1. $\text{dom } P$ $[0, 80]$ 2. $\text{ran } P$ $[-4000, 8000]$

b) Determine and interpret the zeros of P .

The profit is zero when 20, 40 or 60 cameras are sold.

c) Determine the increasing and decreasing intervals for P .

The profit increases over $[0, 30] \cup [50, 80]$ and decreases over $[30, 50]$.

d) Determine and interpret the absolute maximum and minimum of this profit function.

For 0 cameras sold, the company generates its absolute minimum profit, which is a loss of \$4000. For 80 cameras sold, the company generates its absolute maximum profit of \$8000.

e) Determine the relative maximum and minimum of this function.

Rel. max. = 3000 Rel. min. = -1000

