

# Functions training exercises 1

Maths 3c

Training exercises for functions test.

1. Plot the following functions.

$$f(x) = 2x + 3$$

$$g(x) = \frac{1}{3}x$$

$$h(x) = \frac{4}{x-2}$$

$$i(x) = x^2$$

$$j(x) = x^2 - 3x - 10$$

$$k(x) = \sqrt{x-2}$$

$$l(x) = \frac{2^x}{2}$$

$$m(x) = \sqrt{-x^2 + 4}$$

2. Answer the questions below. Buying computer hard drives costs 600 kr per drive plus 400 kr for the shipping. Buying bergamot essential oil costs 9000 kr per litre plus 60 kr for the bottle it comes in.

- Write two functions that express separately the cost in function of the purchase for each of the two products.
- Which one of them is not a continuous function?
- What kind of function is it then?
- How much would it cost to buy 7 hard drives?
- How much would it cost to buy 127 ml of bergamot essential oil?

3. Find a function that

- Passes through (-3,2) and (1,-2)
- Passes through (-4,-1) and (3,6)
- Passes through (-1,0), (-3,2) and (0,2)

4. The function  $o(x) = ax^2 + bx + c$  is a parabole, and it passes through the points  $(3,0)$  and  $(6,0)$ . Answer if true or false.

a)  $o(0) > 0$

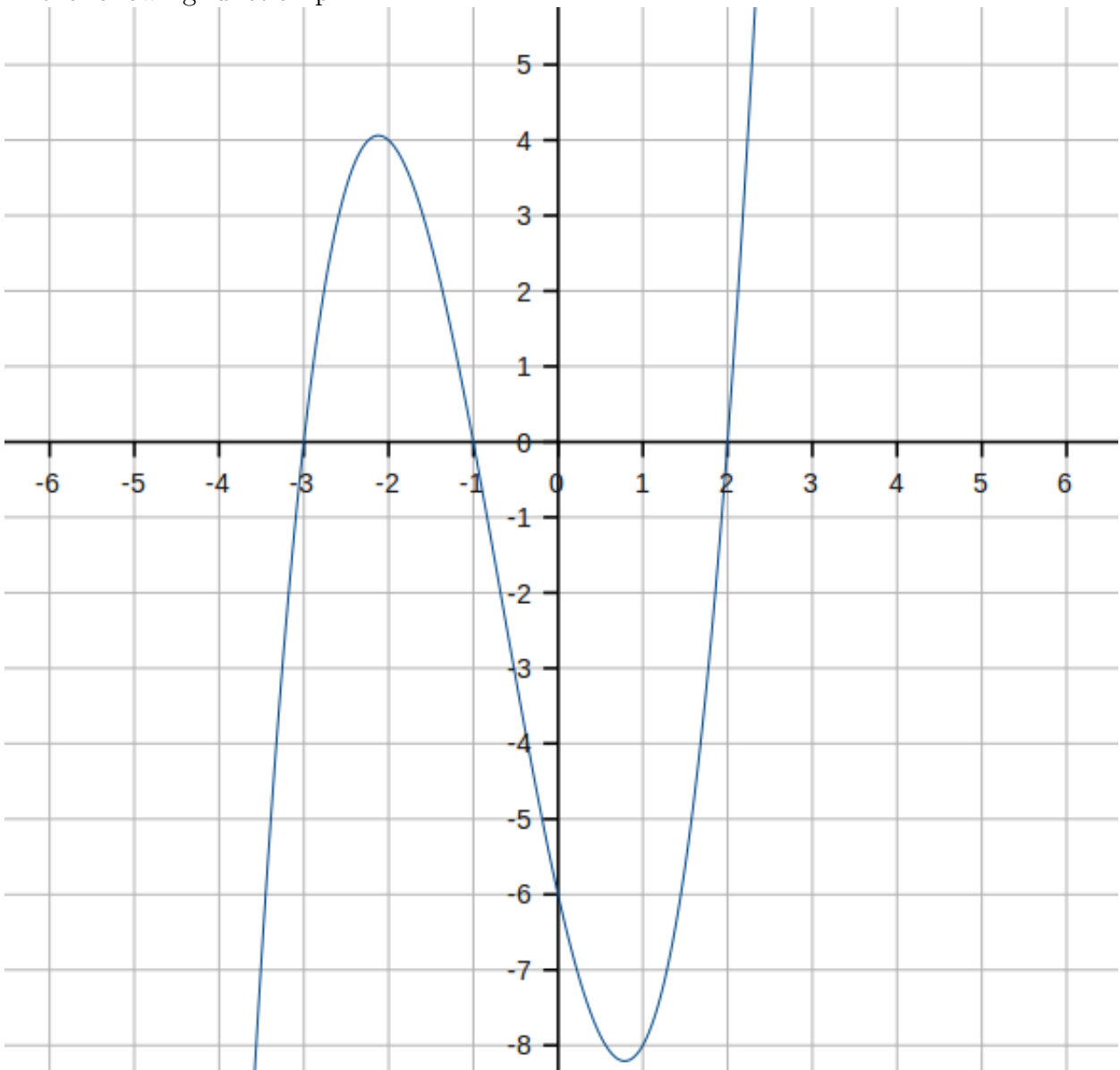
b)  $o(4) > 0$

c) The domain of  $o(x)$  is  $\mathbb{R}$

d) If  $o(4) > 0$  then the function is positive between  $x=3$  and  $x=6$ .

e) If  $o(2) < 0$  then  $o(4) > 0$ .

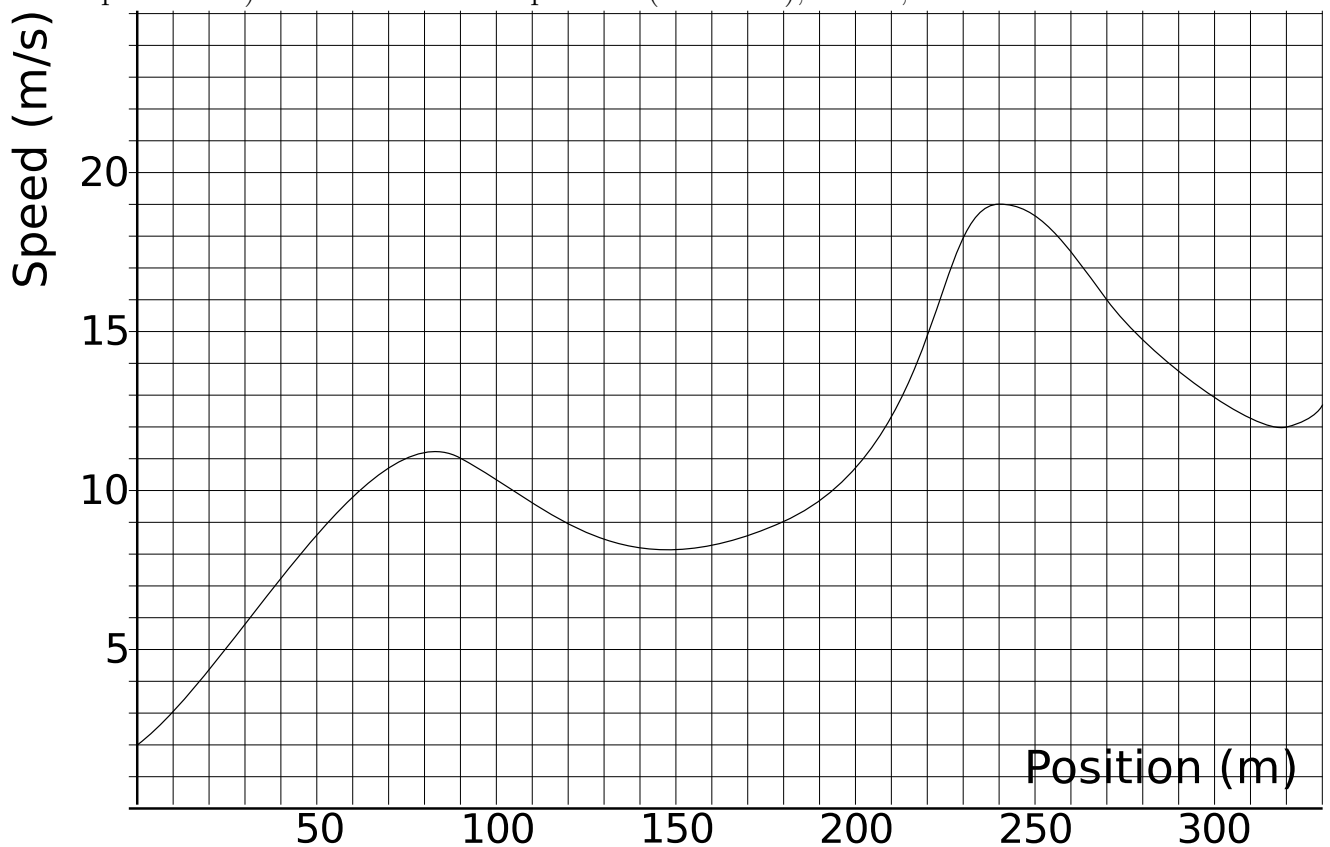
5. In the following function p:



a) Find a value of  $x$  for which  $p(x)$  is positive.

- b) Find a value of  $x$  for which  $p(x)$  is negative.
- c) Find a value of  $x$  for which  $p(x)$  is positive and the function is increasing.
- d) Find a value of  $x$  for which  $p(x)$  is negative and the function is increasing.
- e) Find a value of  $x$  for which  $p(x)$  is positive and the curvature is negative.
- f) Find a value of  $x$  for which both  $p(x)$  and the curvature are positive.
- g) Find a value of  $x$  for which  $p(x)$  is negative, the function is decreasing and the curvature is negative.
- h) Which combination of positive/negative, increasing/decreasing and positive/negative curvature does not exist in that graph?

6. Anna rides her bicycle every day to school. The graph represents the speed of the bicycle (in meters per second) as a function of the position (in meters), that is, the distance she is from home.



- a) What is Anna's initial speed?.
- b) What is her speed when she arrives at the school?.
- c) What is her speed when she has travelled 90m? And when she has travelled 170m? And when she has travelled 270?
- d) After 100m the graph shows a decrease. Does it mean that Anna is travelling backwards?

- e) What is the top speed she reaches?
- f) Mark with the letter  $a$  a point where the speed is increasing.
- g) Mark with the letter  $b$  two points where the speed is neither increasing nor decreasing.
- h) Mark with the letter  $c$  the approximate point where the speed is increasing fastest.

Answers:

1) You can use the plotter suggested in the moodle platform ([moodle.ionma.org](http://moodle.ionma.org)) to plot these functions.

2) a)  $f(x) = 600x + 400$  and  $g(x) = 9000x + 60$  (assuming you only need one bottle)

b) The first one is not continuous.

c) It is a discrete function, because it only responds when the input is a whole number (natural, in this case)

d) 4600Kr

e) 1203Kr

3) a)  $f(x) = -x - 1$  (but there are others)

b)  $g(x) = x + 3$  (but there are others)

c)  $h(x) = x^2 + 3x + 2$  (but there are others)

4) a) False, because we don't know whether the parabole is positive (smiley) or negative (frowney)

b) False, for the same reason.

c) True. None of the four possibilities apply here, so the function can always respond.

d) False. If  $o(4)$  is greater than 0 then the parabole is positive and therefore between 3 and 6 it will have negative values.

e) True. If  $o(2)$  is negative then the parabole is negative, and therefore between 3 and 6 it will have positive values.

5) a) -2 (but there are others)

b) -4 (but there are others)

c) 3 (but there are others)

d) -4 (but there are others)

e) -2 (but there are others)

f) 3 (but there are others)

g) Positive function, decreasing and positive curvature.

6) a) 2m/s

b) 12.5m/s

c) 11m/s

d) No, it only means that the speed is decreasing, but she is still going forward.