

<b>Part B</b>	Problems 1-10 which only require answers.
<b>Part C</b>	Problems 11-16 which require complete solutions.
<b>Test time</b>	120 minutes for Part B and Part C together.
<b>Resources</b>	Formula sheet and ruler.

**Level requirements**

The test consists of an oral part (Part A) and three written parts (Part B, Part C and Part D). Together they give a total of 72 points of which 26 E-, 25 C- and 21 A-points.

Level requirements for test grades

E: 19 points

D: 29 points of which 8 points on at least C-level

C: 38 points of which 15 points on at least C-level

B: 48 points of which 7 points on A-level

A: 57 points of which 12 points on A-level

The number of points you can have for a complete solution is stated after each problem. You can also see what knowledge level(s) (E, C and A) you can show in each problem. For example (3/2/1) means that a correct solution gives 3 E-, 2 C- and 1 A-point.

For problems labelled “*Only answers required*” you only have to give a short answer. For other problems you are required to present your solutions, explain and justify your train of thoughts and, where necessary, draw figures.

**Write your name, date of birth and educational program on all the sheets you hand in.**

Name: \_\_\_\_\_

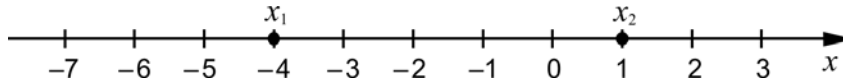
Date of birth: \_\_\_\_\_

Educational program: \_\_\_\_\_



**Part B:** Digital resources are not allowed. *Only answer is required.* Write your answers in the test booklet.

1. Two numbers  $x_1$  and  $x_2$  are pointed out on the number line.



Determine  $|x_1 - x_2|$  \_\_\_\_\_ (1/0/0)

2. For what value of  $x$  is the expression  $\frac{3x-21}{6-x}$  not defined?

\_\_\_\_\_ (1/0/0)

3. Which of the alternatives A-E shows a polynomial?

A.  $\frac{4}{x^3} + 4x^3$

B.  $x^2 + x^{2.5}$

C.  $\left(2 + \frac{1}{x}\right)^3$

D.  $4x^3 + 2x^2$

E.  $\frac{5x}{12x - x^2}$  \_\_\_\_\_ (1/0/0)

4. For what angles  $v$  within the interval  $0^\circ \leq v < 360^\circ$  does it hold that  $\sin v = \frac{1}{2}$ ?

\_\_\_\_\_ (1/0/0)

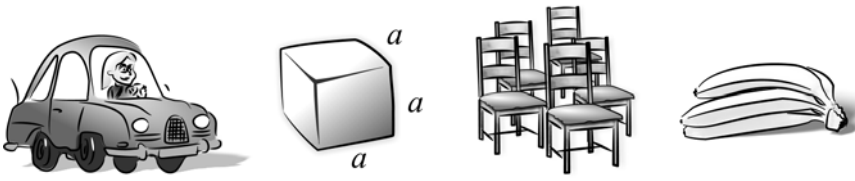
5. Differentiate

a)  $f(x) = 3x^4 + 6x + 10$  \_\_\_\_\_ (1/0/0)

b)  $f(x) = e^x + ex$  \_\_\_\_\_ (0/1/0)

c)  $f(x) = \frac{2}{3x} + \frac{3x}{2}$  \_\_\_\_\_ (0/1/0)

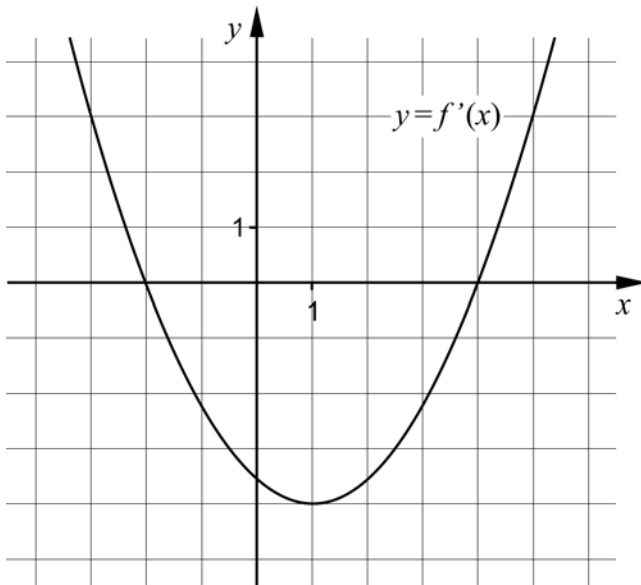
6. Below are some different situations that can be described by a function. Which of the alternatives A-D is best described by a discrete function?



- A. The petrol consumption of a car depends on how far the car is driven.
- B. The volume of a cube depends on the length of its side.
- C. The income depends on how many chairs that are produced in the company.
- D. The cost of bananas depends on the weight of the bananas.

\_\_\_\_\_ (0/1/0)

7. The figure below shows the graph of the derivative  $f'$  of a cubic function  $f$ .



- a) For what value of  $x$  does the graph of  $f$  have a minimum point?

\_\_\_\_\_ (0/1/0)

- b) For what values of  $x$  is  $f$  decreasing?

\_\_\_\_\_ (0/2/0)

8. Write *all* functions with the characteristic that  $f(x) = f'(x)$  where  $f(x) \neq 0$

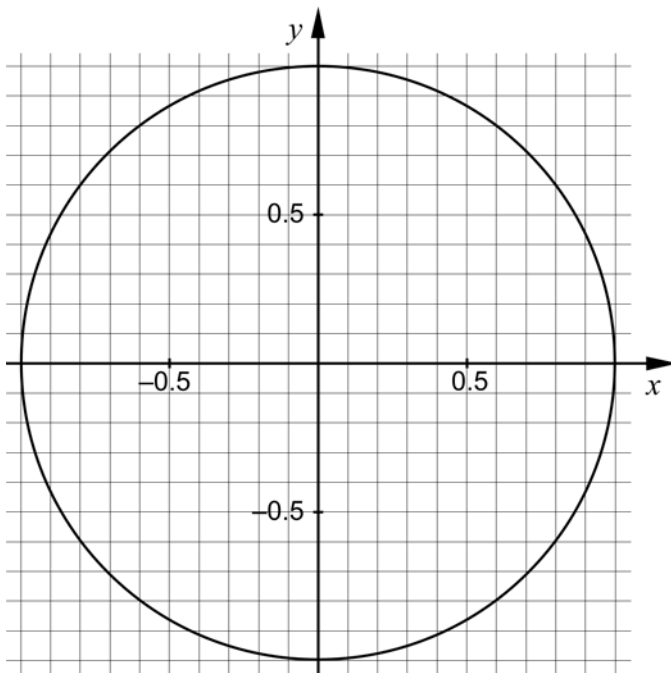
\_\_\_\_\_ (0/1/1)

9. Determine

a)  $\lim_{x \rightarrow 0} (e^{-x} + 7)$  \_\_\_\_\_ (1/0/0)

b)  $\lim_{x \rightarrow \infty} \sqrt{\frac{16x}{4x+9}}$  \_\_\_\_\_ (0/0/1)

10. Use the unit circle and determine  $\cos(180^\circ - v)$  if  $\sin v = 0.8$



\_\_\_\_\_ (0/0/2)

**Part C:** Digital resources are not allowed. Write your solutions on separate sheets of paper.

11. Calculate  $\int_1^2 6x^2 \, dx$  algebraically. (2/0/0)

12. It holds for the function  $f$  that  $f(x) = x^3 - 3x^2$   
 Use the derivative to determine the coordinates of the possible maximum-, minimum- and saddle points to the graph of the function.  
  
 Also determine the character of each point, that is whether it is a maximum-, minimum- or saddle point. (3/0/0)

13. For the functions  $f$  and  $g$  it holds that  $f(x) = 5x^2 + 3x$  and  $g(x) = x^2 + 8x$

a) Determine for what value of  $x$  it holds that the graph of  $f$  has a gradient of 18 (2/0/0)

b) The graph of  $g$  has a tangent at the point where  $x = 6$   
 Determine the coordinates for the tangent's intersection with the  $x$ -axis. (0/3/0)

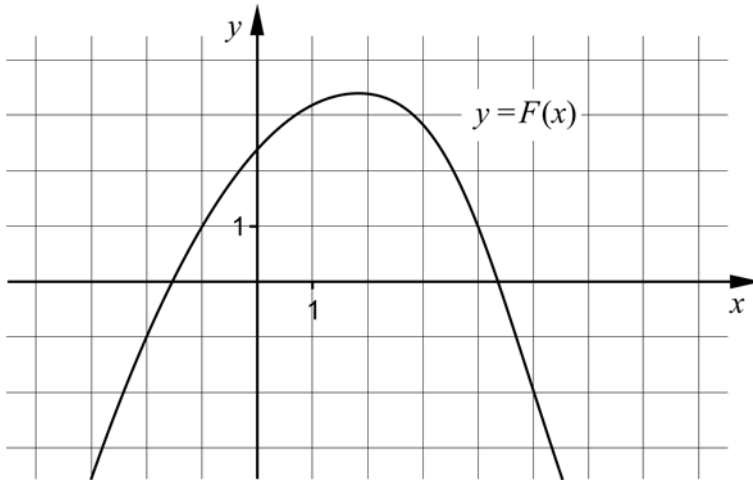
14. Simplify as far as possible.

a)  $\frac{(x-3)(x+2)}{2x-6}$  (1/0/0)

b)  $\frac{x^2 + 8x + 16}{2x^2 - 32}$  (0/2/0)

15.  $F$  is the antiderivative of the function  $f$ .

The figure shows the graph of the function  $F$ . Determine  $\int_{-2}^5 f(x) dx$  (0/0/1)



16. Use the definition of the derivative to determine the derivative of  $f(x) = \frac{A}{x}$  (0/2/2)