

Part B	Problems 1-10 which only require answers.
Part C	Problems 11-16 which require complete solutions.
Test time	120 minutes for Part B and Part C together.
Resources	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 9 points on at least C-level

C: 38 points of which 16 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.

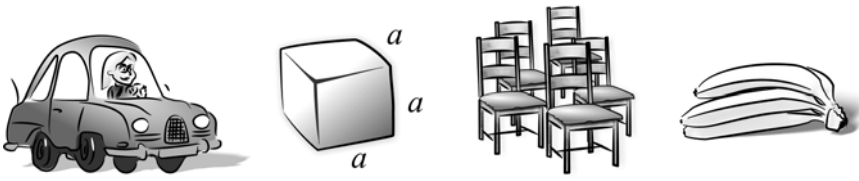
Write your name, date of birth and educational program on all the sheets you hand in.

<p>Name: _____</p> <p>Date of birth: _____</p> <p>Educational program: _____</p>
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Part B: Digital resources are not allowed. *Only answer is required.* Write your answers in the test booklet.

1. What is the fourth term of the geometric progression
 $2 + 2 \cdot 3 + 2 \cdot 3^2 + \dots$? _____ (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. How many real solutions are there to the equation below?
 $(x-1)(x^2-4) = 0$ _____ (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)

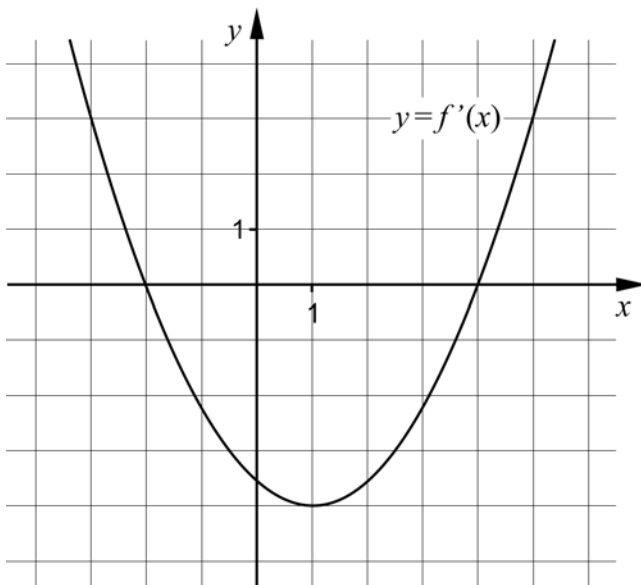
6. Below are some different situations that can be described by a function. Which of the alternatives A-D is best described by a discrete function?



- 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

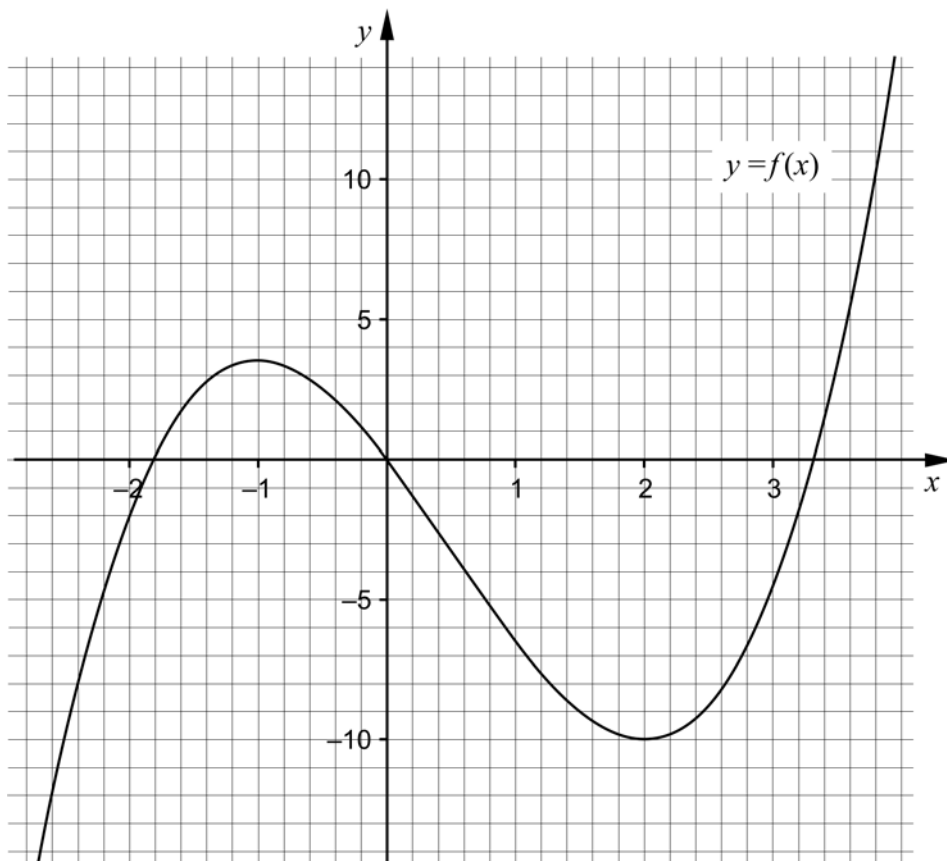
a) $\lim_{x \rightarrow 0} (e^{-x} + 7)$ _____ (1/0/0)

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

10. The figure shows the graph of the cubic function f . Use the graph to answer the following questions.

a) Solve the equation $f(x) + 6.5 = 0$ _____ (0/0/1)

b) It holds for the function g that $g(x) = f(x) + k$ where k is a positive constant. For what values of k does the equation $g(x) = 0$ have only one real solution?
 _____ (0/0/1)



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)

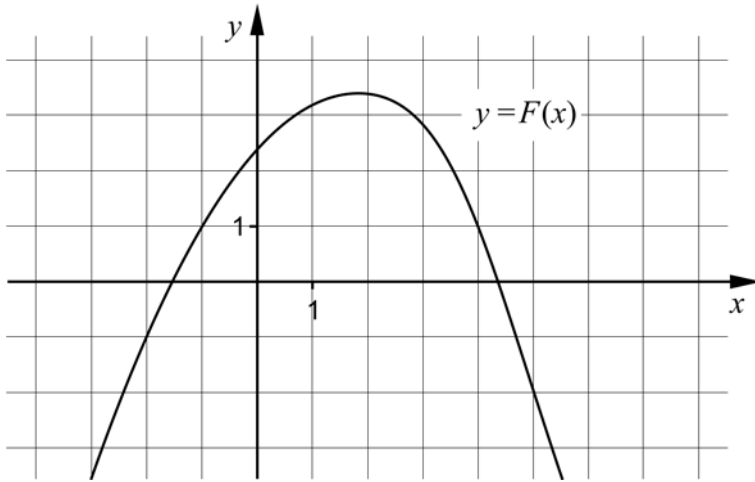
14. Simplify as far as possible.

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)