Part D	Problems 18–25 which require complete solutions.
Test time	120 minutes.
Resources	Digital resources, formula sheet and ruler.

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 67 consisting of 24 E-, 24 C- and 19 A-points.

Level requirements for test grades
E: 17 points
D: 26 points of which 8 points on at least C-level
C: 34 points of which 14 points on at least C-level
B: 44 points of which 6 points on A-level
A: 53 points of which 11 points on A-level

The number of points you can get for a complete solution is stated after each problem. You can also see what knowledge levels (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 answer is 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 thought and, where necessary, draw figures and show how you use your digital resources.

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

Name: ______________________________

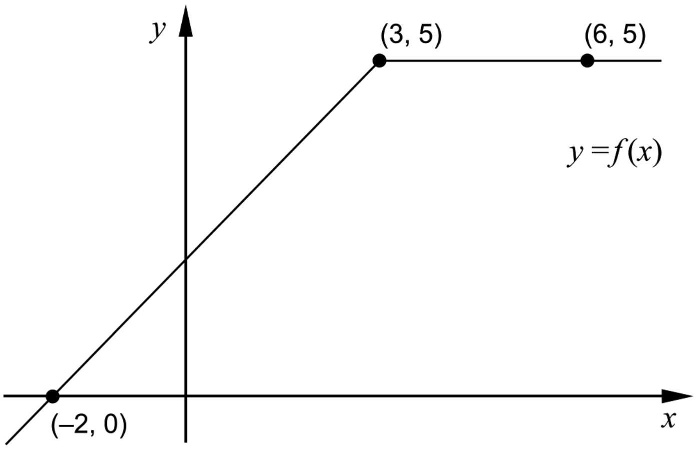
Date of birth: ______________________________

Educational programme: ______________________________

Part D: Digital resources are allowed. Write down your solutions on separate sheets of paper.

18. A geometric sum is given by $3+3\cdot1.2+3\cdot1.2^2+3\cdot1.2^3+...$
Determine the smallest number of terms in order for the sum to *exceed* 6 000 000 (2/0/0)

19. The figure shows the graph of a function *f*. The graph passes through the three marked points.



Evaluate $\int_{-2}^{6} f(x)\,dx$. (2/0/0)

20. The price of a certain UHD TV today is SEK 33 700 but the price rapidly decreases. The value of the TV can be described by the model
$V(t) = 33\,700\,e^{-0.034\cdot t}$
where $V(t)$ is the value of the TV in SEK and t is the time in months after the purchase.

a) Determine after how many months the value of the TV is SEK 20 000 (2/0/0)

b) Determine at what time the decrease in value (in SEK/month) is half the size of the decrease in value at the purchase. (0/2/0)

21. The following conditions are valid for the two variables x and y:

$$\begin{cases} 2y - x \leq 900 \\ y + 2x \geq 1000 \\ x \leq 350 \end{cases}$$

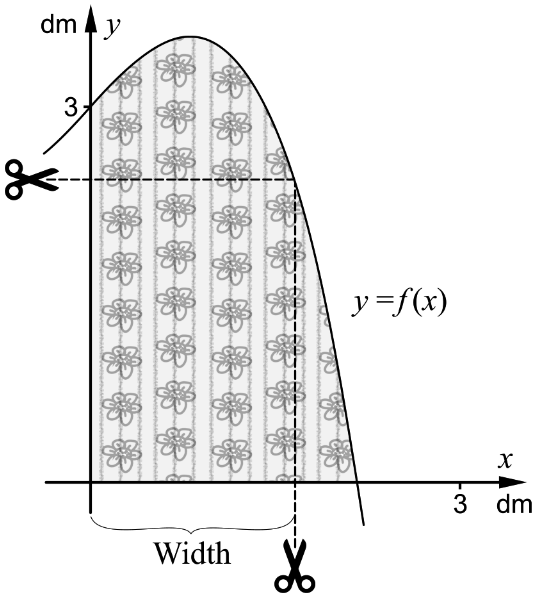
Determine the largest and the smallest value that the function $V = 500x - 200y$ can assume. (0/4/0)

22. Albin's weight can be described by the function
$V(t) = 0.10\,t^3 - 1.23\,t^2 + 6.51\,t + 3.72$
where the weight V kg is a function of the time t years after his birth.
The function is valid for the first six years of his life.

The velocity at which Albin's weight increases varies. Determine what values the velocity can assume during Albin's first six years in life. (0/0/2)

23. It holds for the polynomial function f that $f'(x) > 0$ for all x.
Determine the number of real solutions to the equation $f(x) = 0$ (0/0/2)

24. Sam and Sofia have been given spare pieces of fabric from a furniture factory. The pieces have a rounded side that can be described by the curve $y = -0.5x^3 + x + 3$



They have planned to cut both rectangular and quadratic napkins and want each piece of fabric to suffice for one napkin. They have planned to use the straight edges as sides of the napkins. See figure.

Sam and Sofia want the napkins to have as large area as possible.

a) Determine the width of the *rectangular* napkins so that the area is as large as possible. Answer in dm accurate to two decimal places. (0/2/0)

b) Determine the side of the *quadratic* napkins so that the area is as large as possible. Answer in dm accurate to two decimal places. (0/0/3)

25. It holds for the function *f* that $f(x) = x^3 + kx^2 + 2.9kx$
where the constant $k > 0$
The graph of the function has a saddle point for a certain value of *k*.

Determine this value of *k*. (0/0/3)