

Maths 3c Units 1-4 test

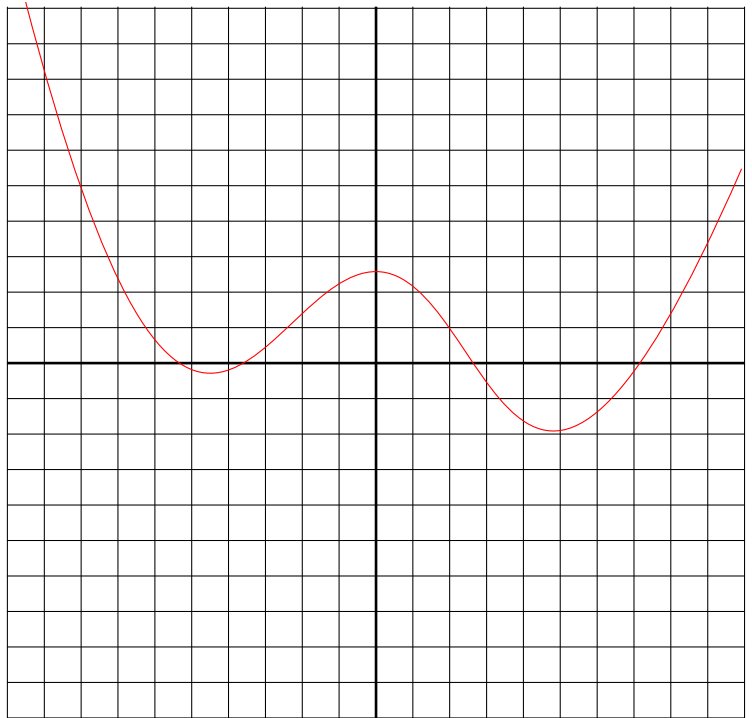
Non-calculator section

1. Given this graph of a function

Find points (mark them as a, b, c...) where:

- a) The function is positive and the derivative is negative
- b) The derivative is positive and the second derivative is negative.
- c) The function is negative and the second derivative is negative as well.
- d) The function is concave and the second derivative is positive.

4p



2. The function

$$f(x) = 6x^3 - 2x^2 + 1$$

Has a critical point at (0,1)

An evaluation of the value at $x = -0.5$ shows that the value is lower than 1, and at $x = 0.5$ the value is higher than 1.

An evaluation of the growth at -0.5 shows that when $x = -0.5$ the derivative has a positive value, and at $x = 0.5$ the derivative also has a positive value.

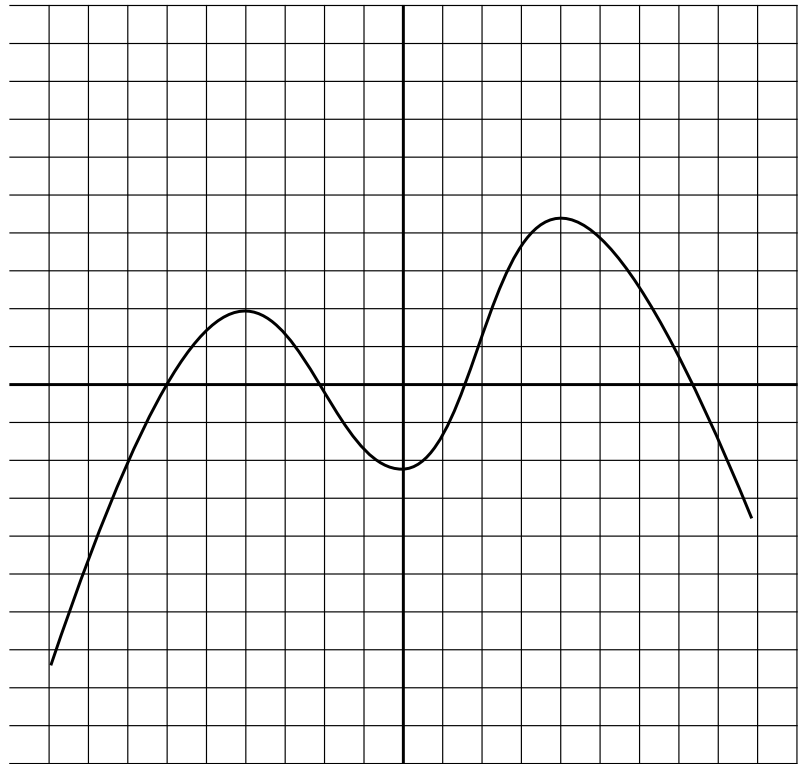
Based on this, discuss whether the point is a terrace point or not.

4p

3. Given this graph

Sketch its derivative, showing all the relevant points. (Do so in the same graph where the function is)

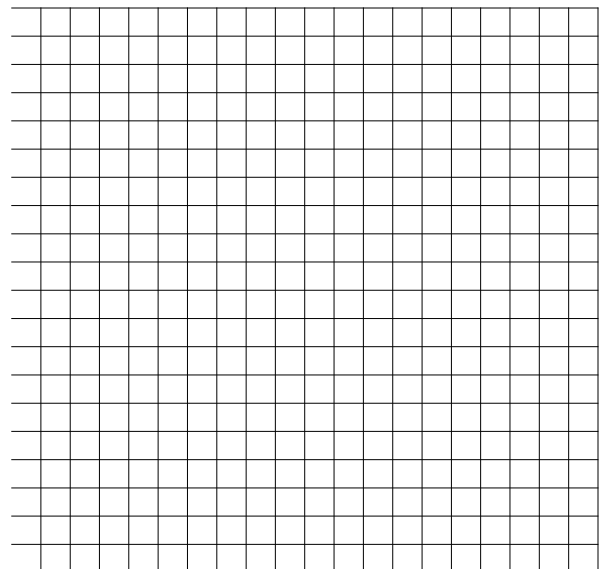
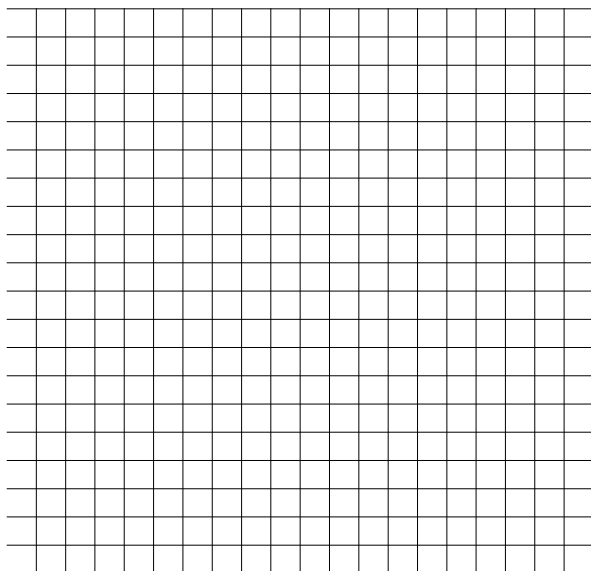
2p



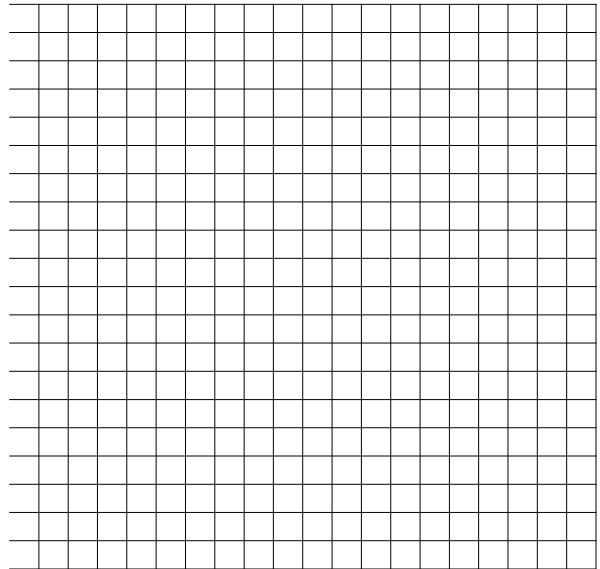
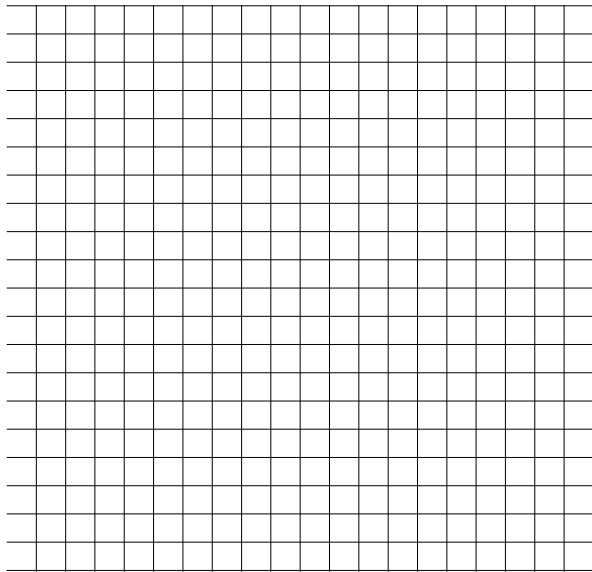
4. Sketch a function that: (note: function must not have anything additional to what is requested)

a) Has one inflexion point and two critical points

b) Has one inflexion point and one critical point



- c) Has two inflexion points but no critical points
- d) Has one inflexion point and one local maximum



4p

5. The function $g(x) = x^3 + 3x^2 + x + 1$ has one inflexion point.
- a) Find the equation of the line that is tangent to the function at that point.
 - b) Explain why the word "tangent" is not entirely correct in this case.

4p

6. Analyze the slope of the function $g(x) = x^3 + 9x^2 + 24x + 2$, characterizing all critical points and finding any terrace or inflexion points.

4p

7. For a given function $y=f(x)$. When $x=5$ the equation of the line tangent to the function has the equation $3x + 2y - 10 = 0$

a) Calculate $f'(5)$

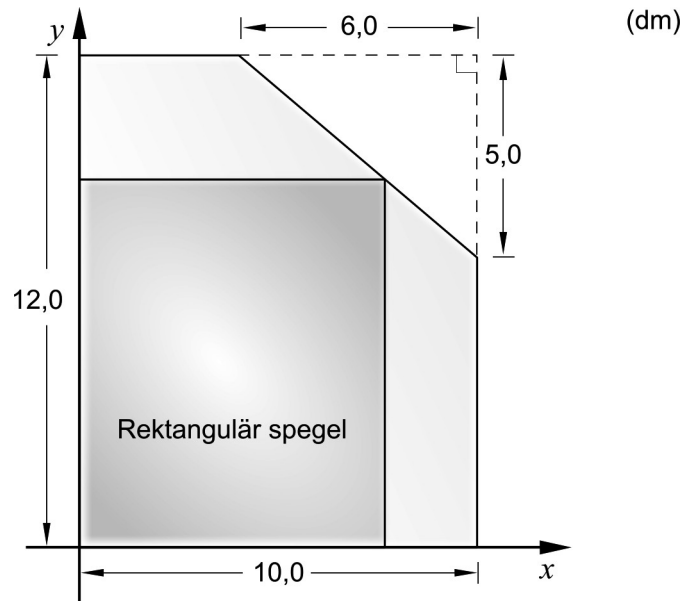
b) Calculate $f(5)$

[Np Ma3c vt 2014] 2p

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Calculator section

8. A glazier has found in her warehouse a large piece of mirror that has one corner accidentally broken as seen below.

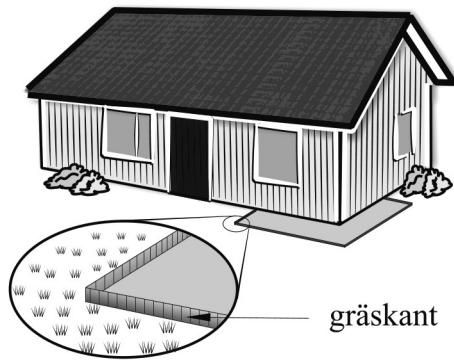


In order to make use of it, the glazier decides to cut a rectangular mirror using some of the existing glass and discarding the rest.

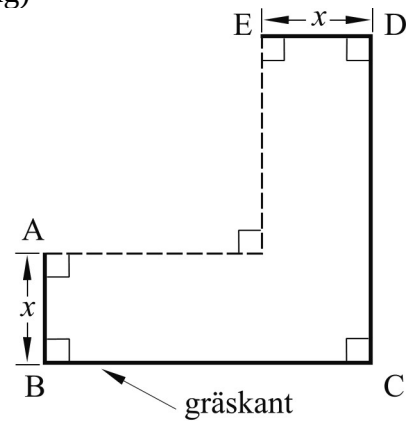
Find the dimensions of the mirror that would make it have as large area as possible.

[Ma3c vt14] 4p

9. A gardener intends to build a flower bed on the corner of a house by using edging and the walls of the house itself, as seen in this picture. (Gräskant = edging)



figur 1



figur 2

The gardener wants the flower bed to be symmetrical, so the sides BC and CD must be equally long.

She goes into her garage and finds a roll of edging that is 6m long.

The gardener figures, after some scribbling on her hand, that the surface area of the flower bed is related to the breadth x by the function $A(x) = 6x - 3x^2$. She briefly thinks to herself: "if this ever becomes a Swedish national exam exercise, being unable to figure this function out would mean that the students can't do the rest of the exercise, so it should be optional but still give three points if they figure it out".

- a) Find x so that the area is as large as possible
- b) Calculate the maximum value of the area.
- c) Figure out the function A

8p