

<b>Part D</b>	Problems 17-26 which require complete solutions.
<b>Test time</b>	120 minutes.
<b>Resources</b>	Digital 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 66 consisting of 24 E-, 23 C- and 19 A-points.

Level requirements for test grades

E: 17 points

D: 27 points of which 8 points on at least C-level

C: 35 points of which 14 points on at least C-level

B: 45 points of which 6 points on A-level

A: 53 points of which 11 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.

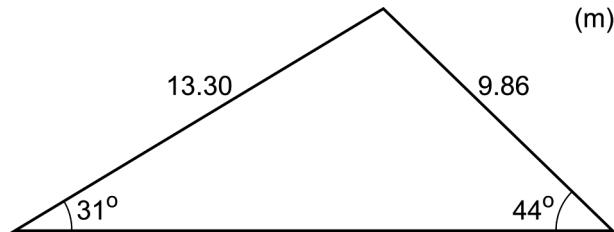
For problems labelled “*Only answer is required*” you only have to give a short answer. For other problems you are required to present your solutions, explain and justify your train of thought and, where necessary, draw figures and show how you use your digital resources.

**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. Do your solutions on separate sheets of paper.

17. Calculate the length of the third side of the triangle.



(2/0/0)

18. Kalle says:

- There is only one antiderivative to  $f(x) = e^x$

Is Kalle right? Justify your answer.

(1/0/0)

19. It holds for the functions  $f$  and  $g$  that  $f(x) = 15x^2$  and  $g(x) = x^3 - 33x$ . Calculate the values of  $x$  where the graphs of the functions have the same gradient.

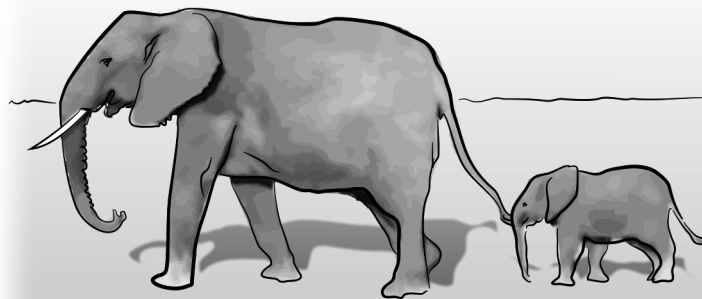
(2/0/0)

20. The weight of an elephant foetus is given by the relation

$$V(t) = 0.310 \cdot e^{0.271 \cdot t} \quad \text{where } t \geq 1$$

$V$  is the weight of the elephant foetus in kg and  $t$  is the time in months after the time of conception.

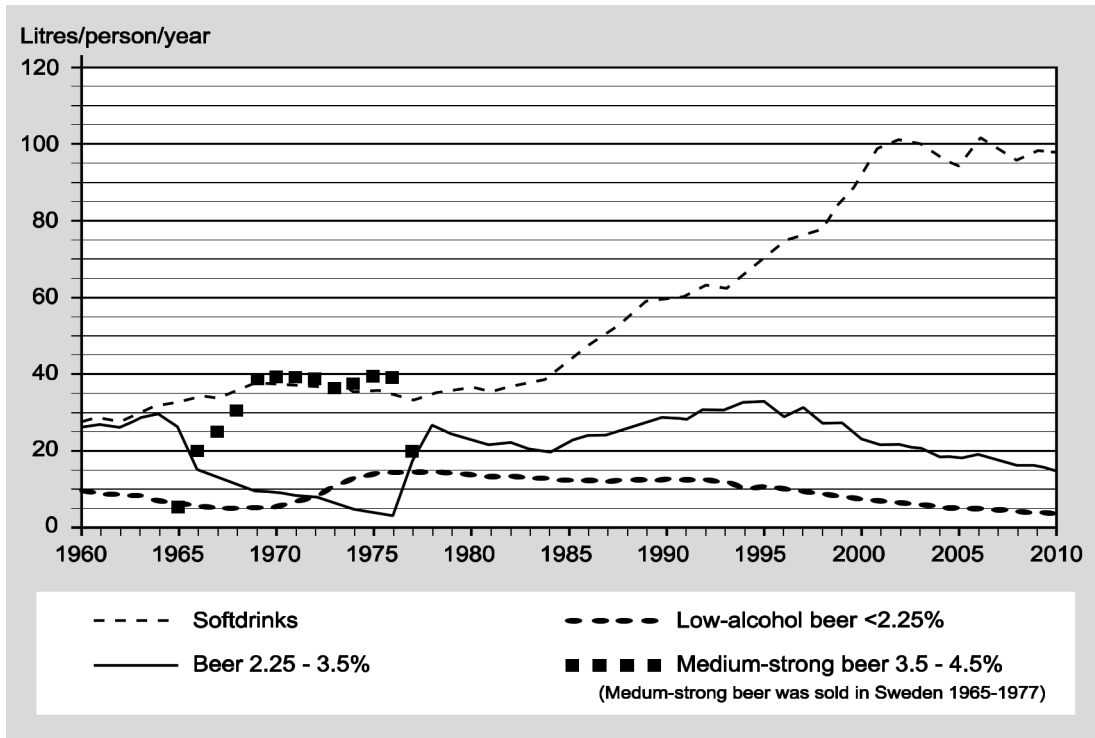
When the elephant calf is born it weighs 120 kg.



How long after the time of conception is the elephant calf born?

(2/0/0)

21. The diagram below shows how the consumption of soft drinks and beer has changed in Sweden since 1960.

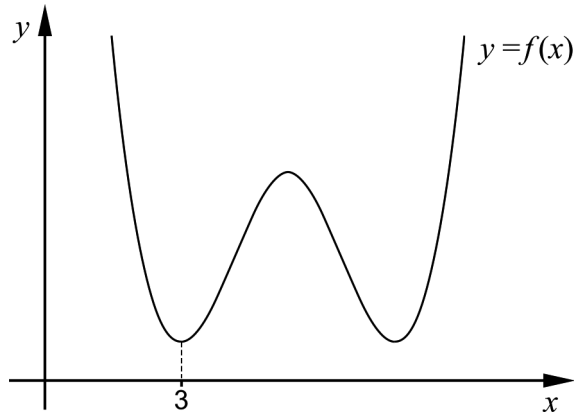


- a) Calculate the average rate of change in (litres/person/year)/year of the consumption of soft drinks during the period 1960-2010. (2/0/0)

The average rate of change of the consumption of medium-strong beer during the period 1966-1977 is 0 (litres/person/year)/year.

- b) Explain why the average rate of change is not a suitable measure for describing how the consumption of medium strong beer has changed during the period 1966-1977. (0/0/1)

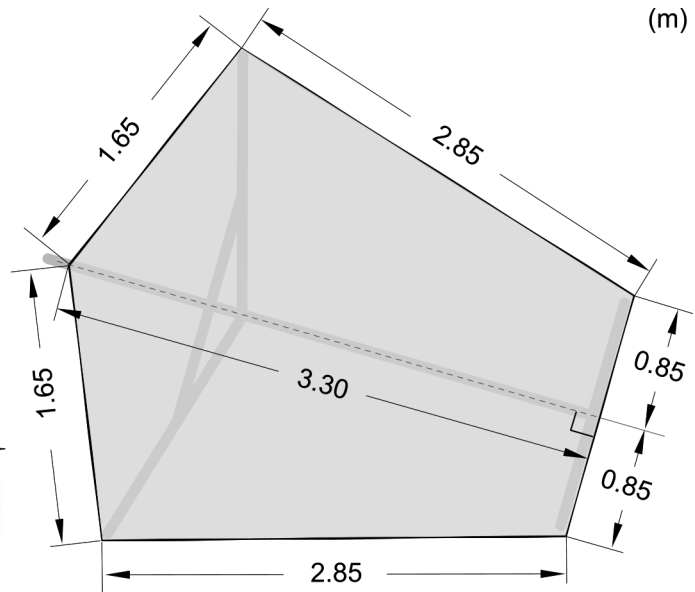
22. The figure shows the graph of the fourth degree polynomial function  $f$ . One of the minimum points has the  $x$ -coordinate 3



Use the appearance of the graph to explain why the sum  $f(3) + f'(3) + f''(3)$  is greater than zero.

(1/1/0)

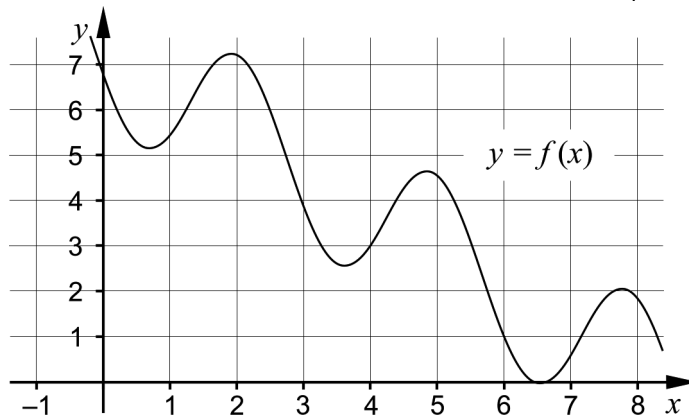
23. Olle often spends his time skate sailing on the Kågefjärd outside Skellefteå. His sail has dimensions according to the figure.



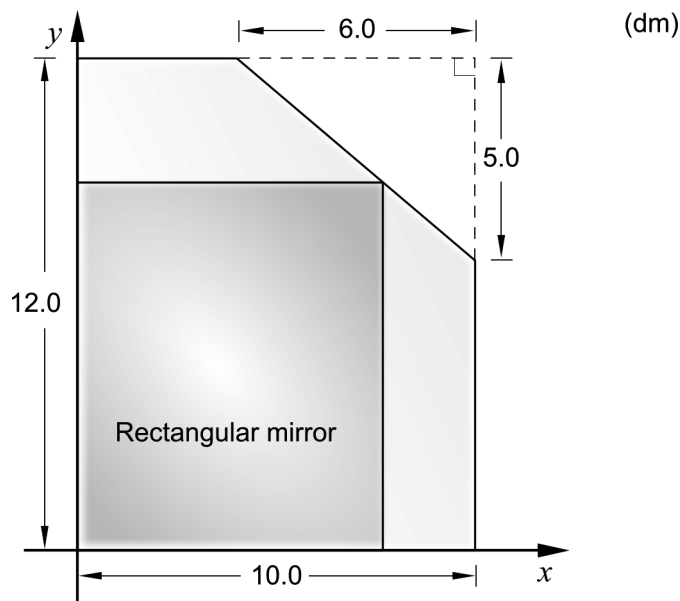
Calculate the area of the sail.

(0/4/0)

24. The figure shows the graph of the function  $f$ . Evaluate  $\int_4^6 f'(x)dx$  (0/0/2)



25. A glazier has, by mistake, cut off one of the corners from a rectangular mirror glass that measured 12.0 dm  $\times$  10.0 dm. The cut-off piece has the shape of a right-angled triangle where the perpendicular sides are 6.0 dm and 5.0 dm, respectively. See figure.



The glazier wants to use the remaining mirror glass for a rectangular mirror that has one of its corners on the cut-off edge. The glazier wants the mirror to have as large area as possible.

Calculate the width that gives the maximum area of the mirror. (0/0/4)

26. A circle touches the positive coordinate axes. The point (5, 7) is located on the boundary of the circle.

Calculate the exact radius of the circle. (0/0/3)