

Concerning test material in general, the Swedish Board of Education refers to the Official Secrets Act, the regulation about secrecy, 4th chapter 3rd paragraph. For this material, the secrecy is valid until the expiration of December 2010.

Directions

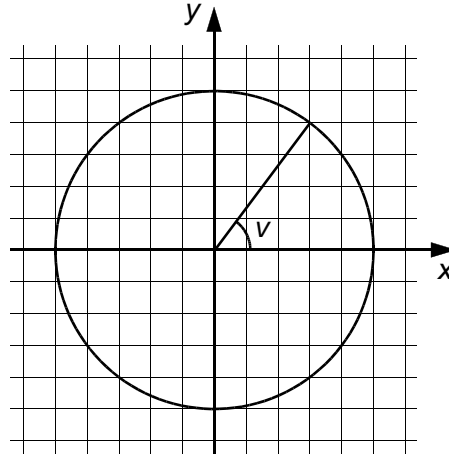
Test time	240 minutes without a break.
Resources	Graphic calculator and “Formulas to National Test in Mathematics Courses C, D and E”.
Test material	<p>The test material should be handed in together with your solutions.</p> <p>Write your name and the name of your education programme / adult education on all the sheets of paper you hand in.</p>
The test	<p>The test consists of 16 problems.</p> <p>For some problems (where it says <i>Only an answer required</i>) you only need to give the answer.</p> <p>For the rest of the problems short answers are not enough. They require that you write down what you do, that you explain your train of thoughts, that you, where necessary, draw figures and that when you solve problems graphically/numerically show how you have used your resources.</p> <p>Problem no 16 is a larger problem that may take you up to one hour to solve completely. It is important that you try to solve this problem. Included in the problem is a description of what the teacher will consider when assessing your work.</p> <p>Try all of the problems. It can be relatively easy, even towards the end of the test, to receive some points for a partial solution or presentation.</p>
Score and mark levels	<p>The maximum score is 48 points.</p> <p>The number of points you can receive for your solution is written after each problem. If a problem can give 2 “Pass”-points and 1 “Pass with distinction”-point this is written (2/1).</p> <p>Lower limit for the test-grade</p> <p>Pass: 14 points</p> <p>Pass with distinction: 26 points of which at least 7 “Pass with distinction”-points</p>

Name: _____ School: _____

Education programme/Adult education: _____

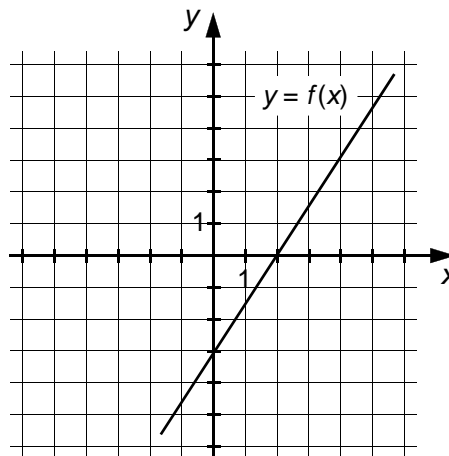
1. Give the primitive functions $F(x)$ to $f(x) = 10x^2 + 100$
Only an answer is required (2/0)

2. The figure below shows a unit circle.



- a) Find $\sin \nu$ *Only an answer is required* (1/0)
 b) Find $\sin(180^\circ - \nu)$ *Only an answer is required* (1/0)

3. The graph to the linear function f is drawn in the figure.
 Find the primitive function to f (2/0)



4. Calculate the integral $\int_1^4 (4 - x^3) dx$ by using a primitive function. (2/0)

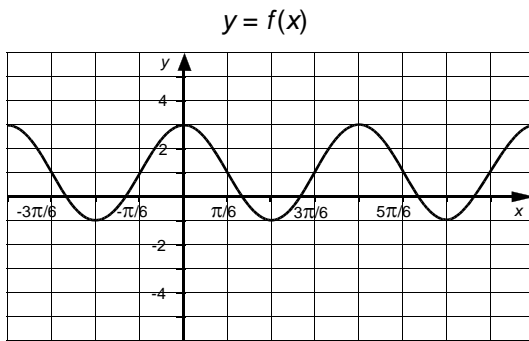
5. In the triangle ABC is $AB = 36.4$ cm, $AC = 25.2$ cm and the angle $C = 120.0^\circ$
 What is the length of side BC ? (3/0)

6. The function f is defined by $f(x) = x \cdot e^x$

a) Find $f'(x)$ (1/0)

b) Solve the equation $f'(x) = 0$ (1/0)

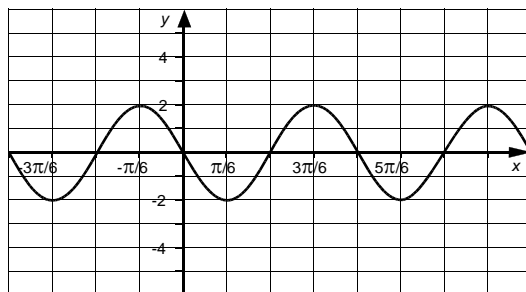
7. The graph to the function $y = f(x)$ is reproduced in the figure below.



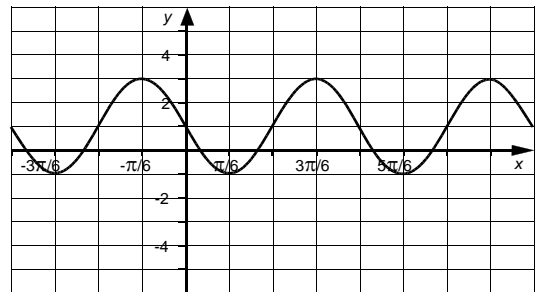
a) Which of the graphs in figures A-D is the best representation of the derivative of the function $y = f(x)$? *Only an answer is required* (1/0)

b) Motivate your answer. (0/2)

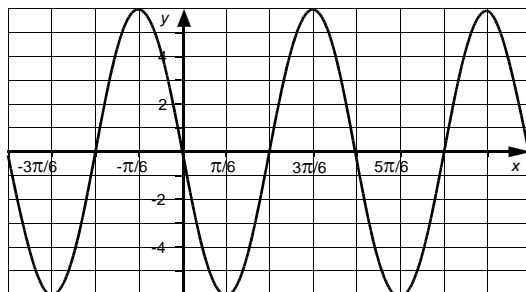
A



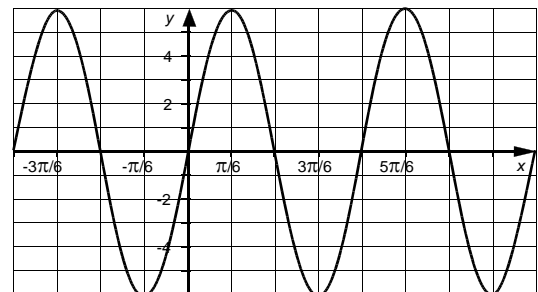
B



C



D



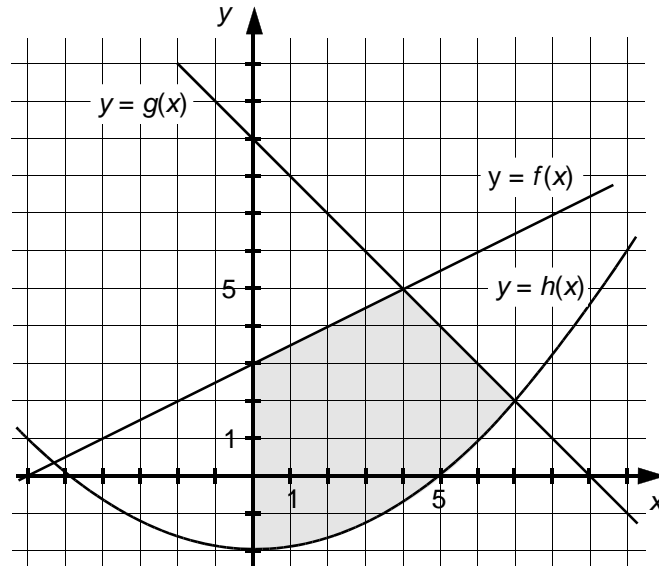
8. The graphs to the three functions f , g and h are drawn in the figure below.

a) Calculate the value of the integral $\int_0^4 (g(x) - f(x)) dx$

Only an answer is required (1/0)

b) By using integrals write down an expression for the area of the shaded area in the figure.

Only an answer is required (0/1)



9. Show that $y = 3e^{3x} + e^{-x}$ is a solution to the differential equation

$$y' - 3y = -4e^{-x}$$

(1/1)

10. In the equation $\int_1^a \frac{2x}{3} dx = 1$ where $a > 1$

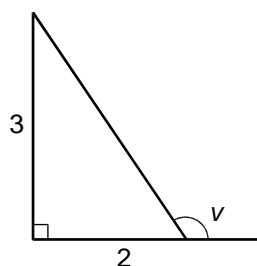
a) Calculate a .

(2/0)

b) The integral in the equation can be interpreted as an area. Draw a figure that represents this area.

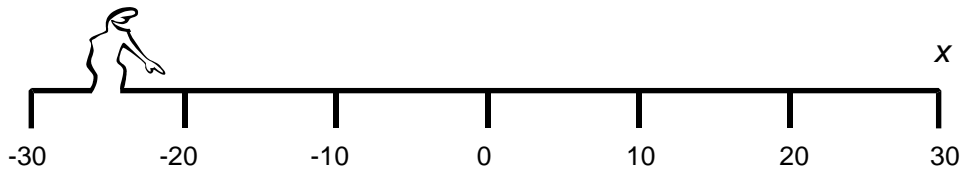
(0/2)

11. The angle v is indicated in the figure. Calculate an **exact** value of $\cos v$.



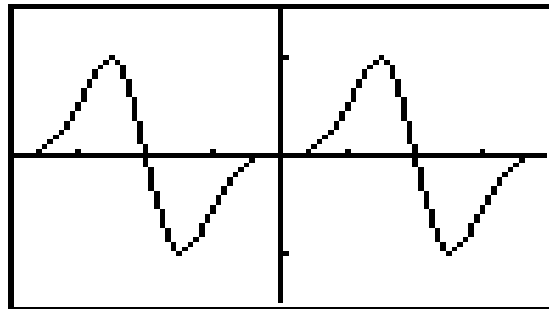
(0/2)

12. Linus is moving along a 60 m long line. To be able to describe where Linus is on the line it has been graded from -30 to 30 as can be seen in the figure below.



Linus starts at time $t = 0$. His position $x(t)$ m on the line is determined by the time t s according to the equation $x(t) = (t - 2)^2(6 - t)$

- Where on the line is Linus at the time $t = 0$? *Only an answer is required* (1/0)
 - Find an expression for Linus' velocity at the time t . (0/2)
 - When Linus turns the velocity is zero. At what times does this happen? (1/0)
13. It seems as if the x -axis is a tangent line to the curve $y = \sin(x - \sin x)$ at the origin (see figure)



Find an expression for the derivative and use that to investigate if the x -axis really is a tangent line to the curve at the origin. (0/2)

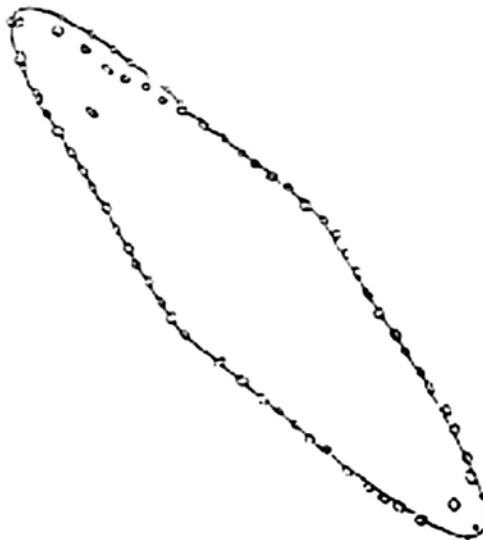
14. Given that $y = 1 - 2(\sin x - \cos x)^2$,
show that $y = 2 \sin 2x - 1$ (0/2)

15. Some twenty kilometres east of Ystad, on the 42 m high ridge of Kåseberga is a place called the Stones of Ale. The stone circle is 70 m long, 18 m wide and consists of 59 stones. The shape of the stone circle has for a long time made people believe that it was a stone ship from the Viking Age. More recent research indicates that it might be a cult centre from the Bronze Age.

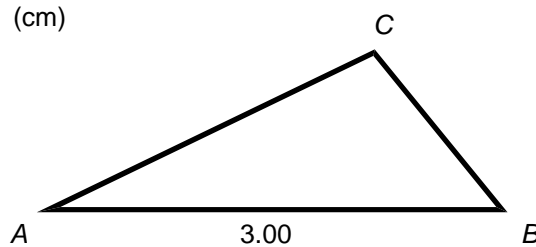


The placing of the stones (see the figure below) can be assumed to follow two opposite parabolas (= graphs to quadratic functions). Your task is to

- a) find a suitable function to one of the parabolas. (0/3)
- b) calculate the area enclosed by the stones. (0/2)



16. In this problem, your task is to investigate how large the area of the triangle ABC can be. The first two points in this problem can be used as support for the investigation. You can choose whether you want to do the general investigation (the third point) at once or if you want to solve the problem step by step using all three points in sequence.



In the triangle ABC side AB is 3.00 cm long and side AC is twice as long as side BC .

- Choose a value of the length of side BC and calculate the area of the triangle ABC by first calculating the angle C .
- Find a value for the length of side BC that gives an area of the triangle larger than the one you calculated in the previous point.
- Investigate how large the area of the triangle ABC can be.

(4/5)

When assessing your work your teacher will consider the following:

- how close to a general solution you are
- how well you present your work
- how well you justify your conclusions