



Question/Answer Booklet

Circle your teacher's initials

GJ

JIB

BAH

Your name

Time allowed for this section

Reading time before commencing work: 5 minutes  
Working time for paper: 50 minutes

Material required/recommended for this section

To be provided by the supervisor  
This Question/answer booklet for Section One.  
Formula sheet.

To be provided by the candidate  
Standard items: pens, pencils, pencil sharpener, highlighter, eraser, ruler.

Important note to candidates

No other items may be taken into the examination room. It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor before reading any further.

## Structure of this examination

	Number of questions	Working time (minutes)	Marks available
<b>This Section (Section 1) Calculator Free</b>	<b>8</b>	<b>50</b>	<b>40</b>
Section Two Calculator Assumed	11	100	80
Total marks			120

## Instructions to candidates

1. The rules for the conduct of WACE external examinations are detailed in the booklet *WACE Examinations Handbook*. Sitting this examination implies that you agree to abide by these rules.
2. Answer the questions in the spaces provided.
3. Spare answer pages are provided at the end of this booklet. If you need to use them, indicate in the original answer space where the answer is continued i.e. give the page number.
4. Show all working clearly. Any question, or part question, worth more than 2 marks requires valid working or justification to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

**Question 8 (6 marks)**

A piece of wire 360 cm long, is used to make the twelve edges of a rectangular box in which the length is twice the breadth. If the breadth of the box is  $x$  cm and the height is  $h$  cm,

- i) Express  $h$  in terms of  $x$  and hence show that the volume of the box is given by
- $$V = 180x^2 - 6x^3$$

[2]

- ii) Find the maximum volume of the box, justifying that it is indeed a maximum.

[4]

- b)

Find the solution to the system of equations given that  $p = 7$ .

[2]

**Question 1 (5 marks)**

Consider the system of equations below;

$$\begin{aligned}x + 3y + pz &= 12 \\x + 2y + 3z &= 2 \\x + y + z &= 4\end{aligned}$$

- a) Show algebraically that  $(p - 5)z = 12$

[3]

**Question 2 (5 marks)**

$$F(a) = \int_0^a (2x+1)^3 dx$$

Consider the integral

Determine

i)  $F(0)$  [1]

ii)  $\frac{d}{da}(F(a))$  [1]

iii) the value of b if  $F(b) = 10$  [3]

See next page

**Question 7 (6 marks)**

Find the exact values of

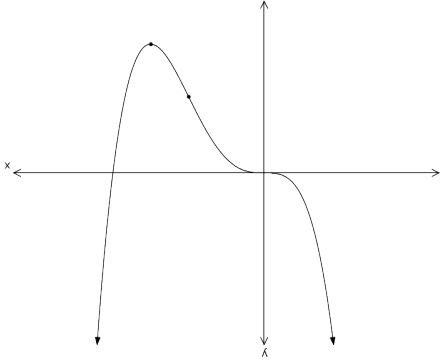
i)  $\int_1^{\sqrt{3}} \frac{x^2 + x^8}{x^5} dx$  [4]

ii)  $\int_0^1 x^2 e^{(x^3)} dx$  [2]

See next page

Question 6 (5 marks)

The graph of the polynomial  $y = ax^4 + bx^3$  is shown below.



- a) Find  $\frac{d^2y}{dx^2}$  for the curve. [2]

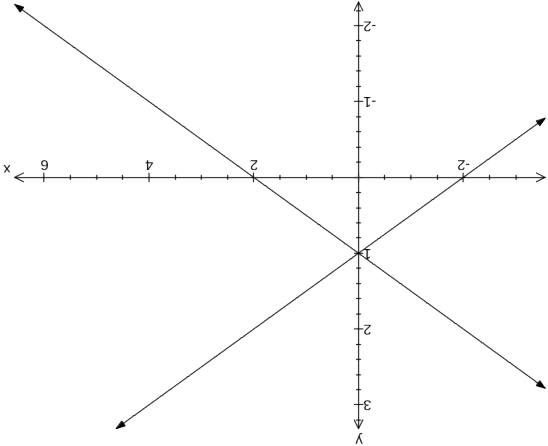
- b) Given that (1, -1) is a point of inflection, determine the values of a and b. [3]

See next page

Question 3 (4 marks)

The graph below shows the lines

$$y = f(x) = \frac{1}{2}x + 1 \text{ and } y = g(x) = -\frac{1}{2}x + 1$$



Find

- i)  $\int_{-2}^{-2} f(x) - g(x) dx$  [1]  
ii)  $\int_{-2}^{-2} |f(x) - g(x)| dx$  [1]  
iii)  $\int_4^1 f(x) - g(x) dx$  [2]

See next page

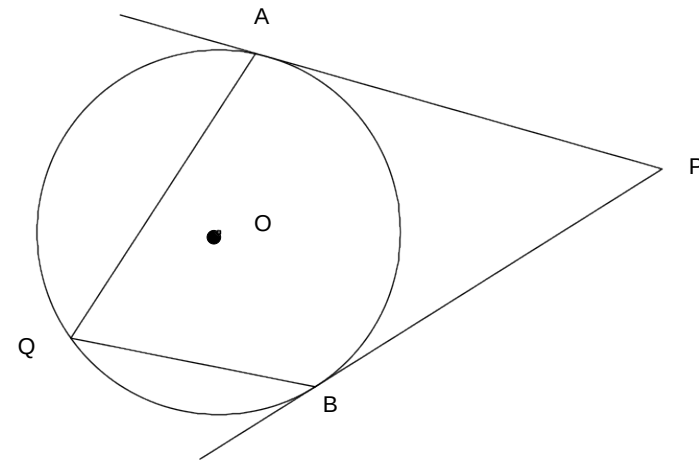
**Question 4 (4 marks)**

A rectangular metal box has sides in the ratio 1 : 2 : 3.

When heated the volume expands at the rate of  $20 \text{ cm}^3$  per second with the sides of the box remaining in the same ratio.

Find the rate at which the shortest side of the box is expanding when it is 10 cm long.

**Question 5 (5 marks)**



The tangents from points A and B meet at the point P and angle APB is known to be  $70^\circ$ .

Find, with full reasoning, the size of angle AQB.