



Name: \_\_\_\_\_

Date: \_\_\_\_\_

IBSL Year 1

Algebra/Functions Test - Paper 2  
Exponentials and Logarithms

Score: /37

CAC%:

IB:

### INSTRUCTIONS TO CANDIDATES

- Write your name in the box above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- Section A: answer all questions in the boxes provided.
- Section B: answer all questions in the answer booklet provided. Write your name on the front of the answer booklet turn it in with your examination paper.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the **Mathematics SL formula booklet** is required for this paper.
- The maximum mark for this examination paper is [37 marks].



Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. In particular, solutions found from a graphic display calculator should be supported by suitable working, for example if graphs are used to find a solution, you should sketch these as part of your answer. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

### Section A

Answer **all** questions in the space provided. Working may be continued in the answer booklet.

1. Let  $f(x) = \ln(x + 2)$ ,  $x > -2$  and  $g(x) = e^{(x-4)}$ ,  $x > 0$ .

(a) Write down the  $x$ -intercept of the graph of  $f$ .

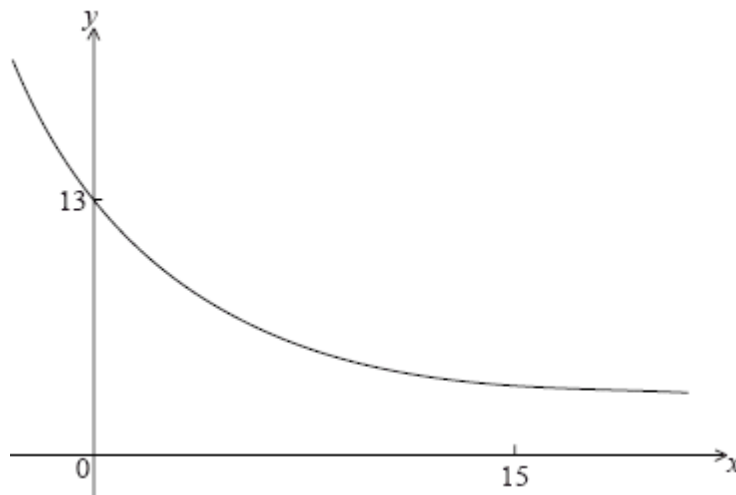
(b) (i) Write down  $f(-1.999)$ .

(ii) Find the range of  $f$ .

(c) Find the coordinates of the point of intersection of the graphs of  $f$  and  $g$ .

**(Total 6 marks)**

2. Let  $f(x) = Ae^{kx} + 3$ . Part of the graph of  $f$  is shown below.



The  $y$ -intercept is at  $(0, 13)$ .

- (a) Show that  $A = 10$ . (2)
- (b) Given that  $f(15) = 3.49$  (correct to 3 significant figures), find the value of  $k$ . (3)
- (c) Write down the equation of the horizontal asymptote of the graph  $f$ . (1)

**(Total 6 marks)**

Do **NOT** write solutions on this page.

## Section B

Answer **all** questions in the answer booklet provided. Please start each question on a new page.

3. Michele invested 1500 francs at an annual rate of interest of 5.25 percent, compounded annually.
- (a) Find the value of Michele's investment after 3 years. Give your answer to the nearest franc. (3)
- (b) How many complete years will it take for Michele's initial investment to double in value? (3)
- (c) What should the interest rate be if Michele's initial investment were to double in value in 10 years? (4)
- (Total 10 marks)**

4. There were 1420 doctors working in a city on 1 January 1994. After  $n$  years the number of doctors,  $D$ , working in the city is given by

$$D = 1420 + 100n.$$

- (a) (i) How many doctors were there working in the city at the start of 2004?  
(ii) In what year were there first more than 2000 doctors working in the city? (3)

At the beginning of 1994 the city had a population of 1.2 million. After  $n$  years, the population,  $P$ , of the city is given by

$$P = 1\,200\,000 (1.025)^n.$$

- (b) (i) Find the population  $P$  at the beginning of 2004.  
(ii) Calculate the percentage growth in population between 1 January 1994 and 1 January 2004.  
(iii) In what year will the population first become greater than 2 million? (7)
- (c) (i) What was the average number of people per doctor at the beginning of 1994?  
(ii) After how many **complete** years will the number of people per doctor first fall below 600? (5)
- (Total 15 marks)**