



MATHEMATICS STANDARD LEVEL PAPER 1

Thursday 2 November 2006 (afternoon)

1 hour 30 minutes

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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all the questions in the spaces provided.
- Unless otherwise stated in the question, all numerical answers must be given exactly or correct to three significant figures.

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, e.g. 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. Working may be continued below the lines, if necessary.

1	Let $\mathbf{A} = \begin{pmatrix} 3 \end{pmatrix}$	2	and $R =$	2	2	Find, in terms of k ,
1.	k	4		1	3	i. Tilia, ili terilis or k,

(a)	2A - B	

(1) 1 (O 4 D	
	1
(b) $\det(2A - B)$	١

- 2. Let $\ln a = p$, $\ln b = q$. Write the following expressions in terms of p and q.
 - (a) $\ln a^3 b$

(b)	ln	$\left(\frac{\sqrt{a}}{b}\right)$	
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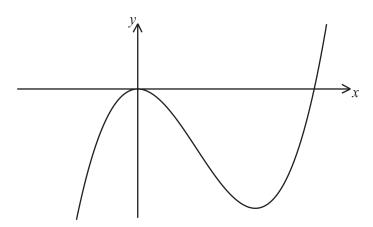
3. The box and whisker diagram shown below represents the marks received by 32 students.



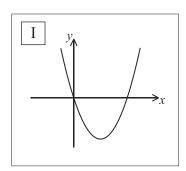
- (a) Write down the value of the median mark.
- (b) Write down the value of the upper quartile.
- (c) Estimate the number of students who received a mark greater than 6.

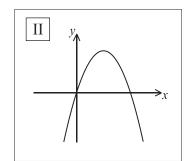
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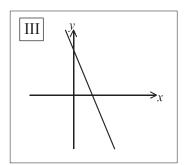
4. The following diagram shows the graph of a function f.

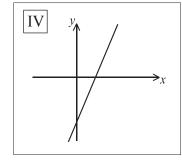


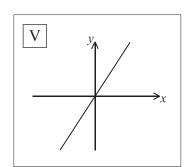
Consider the following diagrams.











Complete the table below, noting which one of the diagrams above represents the graph of

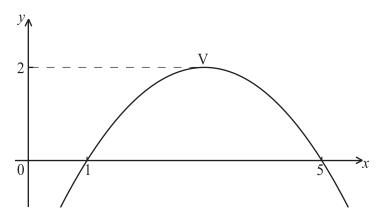
- (a) f'(x);
- (b) f''(x).

	Graph	Diagram
(a)	f'(x)	
(b)	f''(x)	

- 5. Events E and F are independent, with $P(E) = \frac{2}{3}$ and $P(E \cap F) = \frac{1}{3}$. Calculate
 - (a) P(F);

(1.)	-	<i>-</i> -	-
(b)) P((E)	$\supset F$

6. Part of the graph of the function $y = d(x-m)^2 + p$ is given in the diagram below. The x-intercepts are (1, 0) and (5, 0). The vertex is V(m, 2).



- (a) Write down the value of
 - (i) m;
 - (ii) p.
- (b) Find *d*.

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7.	The	line L passes through the points $A(3, 2, 1)$ and $B(1, 5, 3)$.
	(a)	Find the vector \overrightarrow{AB} .
	(b)	Write down a vector equation of the line L in the form $\mathbf{r} = \mathbf{a} + t\mathbf{b}$.



- **8.** Find the **exact** value of x in each of the following equations.
 - (a) $5^{x+1} = 625$
 - (b) $\log_a (3x+5) = 2$

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- Let g(x) = 3x 2, $h(x) = \frac{5x}{x 4}$, $x \ne 4$. 9.
 - Find an expression for $(h \circ g)(x)$. Simplify your answer. (a)

(1.)	0 1 41 4	(1)
(b) Solve the equation	$(h \circ g)(x) = 0$

10.	The velocity v in m s ⁻¹ of a moving body at time t seconds is given by $v = e^{2t-1}$. When $t = 0.5$ the displacement of the body is 10 m. Find the displacement when $t = 1$.

11.	The line L passes through A(0, 3) and B(1, 0). The origin is at O. The point R(x , 3–3 is on L , and (OR) is perpendicular to L .														
	(a)	Write down the vectors \overrightarrow{AB} and \overrightarrow{OR} .													
	(b)	Use the scalar product to find the coordinates of R.													

12.	A fair coin is tossed five times. Calculate the probability of obtaining	
	(a) exactly three heads;	
	(b) at least one head.	

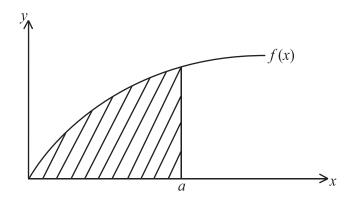
- 13. The function f is defined by $f: x \mapsto 30\sin 3x \cos 3x$, $0 \le x \le \frac{\pi}{3}$.
 - (a) Write down an expression for f(x) in the form $a \sin 6x$, where a is an integer.

	(h)	Solve	$f(\mathbf{r}) = 0$	giving your answers	in terms	of π
١	וטו	SOIVE	f(x) = 0	giving your answers	III terms	01π

14.	The heights of certain flowers follow a normal distribution. It is known that 20 % of these flowers have a height less than 3 cm and 10 % have a height greater than 8 cm.
	Find the value of the mean μ and the standard deviation σ .



15. The shaded region in the diagram below is bounded by $f(x) = \sqrt{x}$, x = a, and the x-axis. The shaded region is revolved around the x-axis through 360°. The volume of the solid formed is 0.845π .



Find the value of a.