S4/1

Class	Register No	Name

Bukit Merah Secondary School
Mid-Year Examination 2017
Secondary 3 Express

E

ADDITIONAL MATHEMATICS

4047

8 May 2017

Additional Materials: Writing Paper (8 sheets)
Cover Page

2 hours

READ THESE INSTRUCTIONS FIRST

Write your class, register number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees unless a different level of accuracy is specified in the question.
The use of a scientific calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of the marks for this paper is **80**.

Mathematical Formulae

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial Theorem

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n ,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{r!(n-r)!} = \frac{n(n-1)\ldots(n-r+1)}{r!}$

1. The equation of a curve is $kx(x+2)=y$ and the equation of a line is $y+k=x+1$ where k is a constant.

(i) Given that the value of k is -1, find the coordinates of the points of intersection of the graphs. [3]

(ii) Show that, for all values of k, the line will always intersect the curve at two distinct points. [2]

2. Given that $a=\log_4 3$ and $b=\log_4 5$, express the following in terms of a and b.

(i) $\log_4 27$ [2]

(ii) $\log_{75} 16$ [3]

3. The roots of the quadratic equation $2x^2-7x+5=0$ are α and β.

(i) Find the value of $\alpha^3+\beta^3$. [4]

(ii) Find a quadratic equation with roots $2\alpha+\beta$ and $\alpha+2\beta$. [4]

4. The area of a rectangle is $(3\sqrt{2}+4\sqrt{3})\text{cm}^2$ and its length is $(2+\sqrt{6})\text{cm}$.

(i) Find the width of the rectangle in the form $(a\sqrt{2}+b\sqrt{3})$, where a and b are integers. [4]

(ii) The area of a square is $(10+4\sqrt{6})\ \text{cm}^2$.

Find the length of the square in the form $(c+d\sqrt{6})$, where c and d are positive integers. [5]

5. **(i)** Find the range of values of k for which $(2k+1)x-1.5x^2=3kx^2+1$ has no real roots for all values of x. [4]

(ii) Find the range of values of x such that $5-x\leq 2x^2-4x<16$. [6]

6. It is given that $f(x)=2x^3+x^2+4x+5$.

(a) Find the remainder when $f(x)$ is divided by

(i) $2x-5$ [2]

(ii) x^2-2x+1 [3]

(b) Show that $x+1$ is a factor of $f(x)$. [1]

(c) Hence, show that the equation $f(x)=0$ has only one real root. [4]

7.

(i) Given that $2^x\div 16=8^y$ and $\left(\frac{1}{9}\right)^{y-2}\times 3^{2x}=27$, find the values of x and y. [5]

(ii) Using an appropriate substitution, solve

$$9(25^x)-242(5^x)-27=0$$ [5]

8. Solve the following equations.

(i) $\log_2 x^2=\log_2(3x-8)+2$ [4]

(ii) $\log_3(2x^2+5x+2)-2\log_4 8=\log_9(x+2)^2$ [7]

9. Express the following in partial fractions.

(i) $\dfrac{5x^2+x}{(x-1)(x+2)}$ [5]

(ii) $\dfrac{4x^3-6x^2+4x-8}{x^2(x^2+4)}$ [7]

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Bukit Merah Secondary School
Sec 3 Express – Additional Math MYE 2017 Answer Key

1 (i)	(- 1, 1) and (-2 , 0)	Q5 (i)	$-\frac{1}{2} < k < \frac{5}{2}$
(ii)	$b^2 - 4ac = 1 > 0$ Hence, the line will always intersect the curve at two distinct points.	(ii)	$-2 < x \leq -1$ or $\frac{5}{2} \leq x < 4$
2 (i)	$3a$	Q6 (a)(i)	52.5
(ii)	$\frac{2}{a+2b}$	(a)(ii)	$12x$
3 (i)	$16\frac{5}{8}$	Q7 (i)	$x = -2.75,\ y = -2.25$
(ii)	$x^2 - \frac{21}{2}x + 27 = 0$ (or $2x^2 - 21x + 54 = 0$)	(ii)	$x = 2.05$
Q4 (i)	$(3\sqrt{2} - \sqrt{3})$ cm	Q8 (i)	$x = 8$ or 4
		(ii)	$x = 13$
(ii)	$(2 + \sqrt{6})$ cm		
		Q9 (i)	$\frac{5x^2 + x}{(x-1)(x+2)} = 5 + \frac{2}{x-1} - \frac{6}{x+2}$
		(ii)	$\frac{4x^3 - 6x^2 + 4x - 8}{x^2(x^2+4)} = \frac{1}{x} - \frac{2}{x^2} + \frac{3x-4}{x^2+4}$