

QM016
Mathematics
Semester I
2009/2010
1 hour

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Matematik
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1 jam



BAHAGIAN MATRIKULASI
KEMENTERIAN PELAJARAN MALAYSIA
MATRICULATION DIVISION
MINISTRY OF EDUCATION MALAYSIA

UJIAN PERTENGAHAN SEMESTER PROGRAM MATRIKULASI
MID-SEMESTER EXAMINATION

MATEMATIK
1 jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU.
DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

ARAHAN KEPADA CALON:

Kertas soalan ini mengandungi 7 soalan.

Jawab **semua** soalan.

Markah penuh yang diperuntukkan bagi tiap-tiap soalan atau bahagian soalan ditunjukkan dalam kurungan pada penghujung soalan atau bahagian soalan.

Semua langkah kerja hendaklah ditunjukkan dengan jelas.

Kalkulator saintifik yang tidak boleh diprogramkan sahaja boleh digunakan.

Jawapan berangka boleh diberi dalam bentuk π , e , surd, pecahan atau sehingga tiga angka bererti, di mana-mana yang sesuai, kecuali jika dinyatakan dalam soalan.

INSTRUCTIONS TO CANDIDATE:

This question booklet consists of 7 questions.

Answer **all** questions.

The full marks for each question or section are shown in the bracket at the end of each of the question or section.

All steps must be shown clearly.

Only non-programmable scientific calculators can be used.

Numerical answers can be given in the form of π , e , surd, fractions or up to three significant figures, where appropriate, unless stated otherwise in the question.

Kertas soalan ini mengandungi 7 halaman bercetak.
This booklet consists of 7 printed pages.

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LIST OF MATHEMATICAL FORMULAE

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

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

For an arithmetic series:

$$T_n = a + (n-1)d$$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

For a geometric series:

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r}, r \neq 1$$

Binomial expansion:

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

$$\text{where } n \in \mathbb{N} \text{ and } \binom{n}{r} = \frac{n!}{(n-r)!r!}$$

1. (a) Solve $9^{4x+1} = 27$.
[3 marks]
- (b) Given $z_1 = 4 - 3i$ and $z_2 = 3 + 2i$. Find $z_1 z_2$ in the form of $a + bi$.
[3 marks]
2. If α and β are roots of the equation $5x^2 - 2x - 9 = 0$, find the quadratic equation whose roots are α^2 and β^2 .
[5 marks]
3. Solve $|x + 4| > 2|x - 1|$.
[5 marks]
4. The polynomial $P(x) = 2x^3 - 3ax^2 + ax + b$ has $(x - 1)$ as a factor and leaves a remainder of -54 when divided by $(x + 2)$. Find the values of a and b .
[6 marks]
5. Express $\frac{3}{(x - 1)^2(x + 1)}$ as partial fractions.
[6 marks]
6. Given that $\log_2 x - \log_x 8 + \log_2 2^k + k \log_x 4 = 0$. If $y = \log_2 x$, show that $y^2 + ky + 2k - 3 = 0$. Find
[4 marks]
- (a) the set of values of k for which y is real.
[4 marks]
- (b) the value of x when $k = 6$.
[3 marks]

7. Show that $(1+ax)^{-\frac{1}{2}} = 1 - \frac{a}{2}x + \frac{3a^2}{8}x^2 + \dots$

Given that $(1+x^2)(1+ax)^{-\frac{1}{2}} = 1+x+bx^2 + \dots$. Find the values of a and b .

State the set of values of x for which the above expansion is valid.

[11 marks]

END OF BOOKLET