QS026
Mathematics
Semester II
Session 2010/2011
1 hour

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Matematik
Semester II
Sesi 2010/2011
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 pada buku jawapan yang disediakan.

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 in the answer booklet provided.

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.*

SHAMMAL

LIST OF MATHEMATICAL FORMULAE

Trigonometry

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$
$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$
$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$\sin A + \sin B = 2 \sin\left(\frac{A+B}{2}\right) \cos\left(\frac{A-B}{2}\right)$$
$$\sin A - \sin B = 2 \cos\left(\frac{A+B}{2}\right) \sin\left(\frac{A-B}{2}\right)$$
$$\cos A + \cos B = 2 \cos\left(\frac{A+B}{2}\right) \cos\left(\frac{A-B}{2}\right)$$
$$\cos A - \cos B = -2 \sin\left(\frac{A+B}{2}\right) \sin\left(\frac{A-B}{2}\right)$$

Hyperbolic

$$\sinh(x \pm y) = \sinh x \cosh y \pm \cosh x \sinh y$$
$$\cosh(x \pm y) = \cosh x \cosh y \pm \sinh x \sinh y$$
$$\cosh^2 x - \sinh^2 x = 1$$
$$1 - \tanh^2 x = \operatorname{sech}^2 x$$
$$\coth^2 x - 1 = \operatorname{cosech}^2 x$$
$$\sinh 2x = 2\sinh x \cosh x$$
$$\cosh 2x = \cosh^2 x + \sinh^2 x$$

Differentiation and Integration

$f(x)$	$f'(x)$
$\cot x$	$-\operatorname{cosec}^2 x$
$\sec x$	$\sec x \tan x$
$\operatorname{cosec} x$	$-\operatorname{cosec} x \cot x$

$f(x)$	$f'(x)$
$\coth x$	$-\operatorname{cosech}^2 x$
$\operatorname{sech} x$	$-\operatorname{sech} x \tanh x$
$\operatorname{cosech} x$	$-\operatorname{cosech} x \coth x$

$$\int \frac{f'(x)}{f(x)} \, dx = \ln|f(x)| + c$$

1   Given $f(x) = x^2 - px + q$ has a stationary point at $(3, -1)$, where p and q are

constants. Find the value of p and q.

[5 *marks*]

2   By using $\cos 3x = 4\cos^3 x - 3\cos x$, evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \cos^3 x \, dx$.

[5 *marks*]

3   (a)   By using the definition of the hyperbolic function, solve $\tanh x = \dfrac{1}{2}$.

[3 *marks*]

(b)   Given that $y = x \sinh x - 2\cosh x$, show that $\dfrac{d^2 y}{dx^2} = y + 2\cosh x$.

[3 *marks*]

4   The major vertices of an ellipse are $(-1, 2)$ and $(9, 2)$. The distance between the

two foci of the ellipse is 8 units. Find the standard equation of the ellipse.

[6 *marks*]

5   (a)   Show that $\dfrac{1 - \cos^2 \theta}{\sec^2 \theta - 1} = \cos^2 \theta$.

[4 *marks*]

(b)   Given $f(x) = \sin^2(3x)\cos(3x)$. Show that $f'(x) = 3\sin 3x \left(2 - 3\sin^2 3x\right)$.

[3 *marks*]

6   The Cartesian equation of the hyperbola is given by $5x^2 - 10x - 4y^2 + 32y = 79$.

   (a)   Express the Cartesian equation of the hyperbola in the standard form.

[3 *marks*]

   (b)   Determine the coordinate of the centre, vertices and foci of the hyperbola.

[5 *marks*]

   (c)   Sketch the graph of the hyperbola.

[3 *marks*]

7   Given $f(\theta) = \cos\theta + \sqrt{3}\sin\theta$.

   (a)   Express $f(\theta)$ in the form of $R\cos(\theta - \alpha)$ where $R > 0$ and
         $0° \leq \alpha \leq 90°$.

[6 *marks*]

   (b)   Find the roots of $f(\theta)$ for $0° \leq \theta \leq 360°$.

[4 *marks*]

END OF QUESTION BOOKLET