QS026
Mathematics
Semester II
2005/2006
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 **5** halaman bercetak.
*This booklet consists of **5** printed pages.*

1. Find the equation of the normal to the curve $y^2 + xy = 3x$ at the point $(4, 2)$.

[5 *marks*]

2. Given the equation of a hyperbola $16x^2 - 9y^2 - 32x - 9 = 0$.

   (a) Express the equation in the standard form.

   (b) Determine the coordinates of the centre and vertices.

   (c) Write the equation of one of the asymptotes.

[6 *marks*]

3. Given $f(x) = \dfrac{2x}{x^2 + 1}$. Find the stationary points to the curve, and determine the maximum and the minimum points.
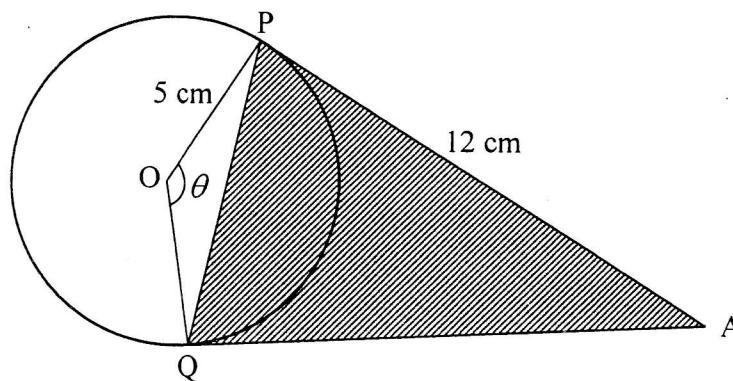
[6 *marks*]

4. Find $\int \cos^2 x \, \sin^3 x \, dx$.

[6 *marks*]

5. The diagram below shows a circle with centre O, and radius 5 cm. AP and AQ are tangents to the circle. Given that AP = 12 cm, calculate:

   (a) θ in radians,

   (b)   the area of the shaded region.

[7 *marks*]

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6. Given the circles $C_1 : x^2 + y^2 - 10x + 18y + 70 = 0$, and

$$C_2 : x^2 + y^2 - 6y - 7 = 0.$$

Find the centers and radii of both circles, and hence show that these two circles do not touch each other. Determine the shortest distance between them.

[10 *marks*]

7. Express $2 \sin \theta + 3 \cos \theta$ in the form of $R\sin(\theta + \beta)$, $R > 0$. Hence, solve

$$2 \sin \theta + 3 \cos \theta = 3 \quad \text{for} \quad 0 \le \theta \le 360°,$$

correct to 3 significant figures.

[10 *marks*]

END OF QUESTIONS

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