

QS025  
Mathematics  
Semester II  
Session 2013/2014  
1 hour

QS025  
Matematik  
Semester II  
Sesi 2013/2014  
1 jam



**BAHAGIAN MATRIKULASI**  
*MATRICULATION DIVISION*

**UJIAN PERTENGAHAN SEMESTER PROGRAM MATRIKULASI**  
*MID-SEMESTER EXAMINATION*

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**MATEMATIK**  
**1 jam**

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

**ARAHAN KEPADA CALON:**

Kertas soalan ini mengandungi 6 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  $\pi$ ,  $e$ , surd, pecahan atau sehingga tiga angka bererti, di mana-mana yang sesuai, kecuali jika dinyatakan dalam soalan.

**INSTRUCTIONS TO CANDIDATE:**

This question paper consists of 6 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 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  $\pi$ ,  $e$ , surd, fractions or up to three significant figures, where appropriate, unless stated otherwise in the question.

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Kertas soalan ini mengandungi 7 halaman bercetak.

*This question paper consists of 7 printed pages.*

## LIST OF MATHEMATICAL FORMULAE

## Numerical Methods

## Iteration Method:

$$x_{n+1} = g(x_n), \quad n = 1, 2, 3, \dots \text{ where } |g'(x_1)| < 1$$

## Newton-Raphson Method:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}, \quad n = 1, 2, 3, \dots$$

## Conics

## Circle:

$$(x-h)^2 + (y-k)^2 = r^2$$

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

$$xx_1 + yy_1 + g(x+x_1) + f(y+y_1) + c = 0$$

$$r = \sqrt{f^2 + g^2 - c}$$

$$d = \sqrt{a^2 + b^2 + 2ga + 2fb + c}$$

## Parabola:

$$(x-h)^2 = 4p(y-k)$$

$$(y-k)^2 = 4p(x-h)$$

$$F(h+p, k) \text{ or } F(h, k+p)$$

## Ellipse:

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

$$F(h \pm c, k) \text{ or } F(h, k \pm c)$$

1 By substituting  $u = 1 + e^x$ , evaluate  $\int_0^1 \frac{e^x}{1 + e^x} dx$ . Give your answer in terms of  $e$ .

[6 marks]

2 Evaluate  $\int_1^2 x^2 \ln 3x dx$  correct to three decimal places.

[6 marks]

3 By using separable variable method, find the general solution of the differential equation  $\frac{dy}{dx} = \frac{y}{2(x-1)}$ . Hence, determine the particular solution if  $y = 2$  when  $x = 5$ .

[7 marks]

4 Given  $e^x = 4 - x$ .

(a) Show that, there is a real root between 1 and 2.

[3 marks]

(b) Hence, by using the Newton-Raphson method, find the root of the equation correct to four decimal places. Given that  $x_0 = 1.2$  as the first approximation.

[4 marks]

- 5 (a) Find the area of the region bounded by the curve  $x = y^2$  and the straight line  $y + x - 2 = 0$ .  
[7 marks]
- (b) The region bounded by  $y = x^2 + 3x$ ,  $x = -3$  and  $x = -1$  is rotated completely about the x-axis. Find the volume of the solid formed.  
[5 marks]
- 6 (a) A circle with center  $(4, -2)$  passes through the points  $(10, 6)$  and  $(a, 8)$ . Find
- (i) the value of  $a$ .
- (ii) the general equation of the circle.  
[7 marks]
- (b) Find the standard equation of a parabola with its symmetric axis parallel to the x-axis, vertex at the point  $(3, 2)$  and passing through the point  $(4, 4)$ .  
[5 marks]

**END OF QUESTIONS PAPER**