Paper Reference(s)

**6665/01**

**Edexcel GCE**

**Core Mathematics C3**

#### Advanced Level

**Friday 12 June 2015 −**  **Morning**

**Time: 1 hour 30 minutes**

**Materials required for examination Items included with question papers**Mathematical Formulae (Pink)Nil

**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation or symbolic differentiation/integration, or have**

**retrievable mathematical formulae stored in them.**

**Instructions to Candidates**

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C3), the paper reference (6665), your surname, initials and signature.

**Information for Candidates**

A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.

Full marks may be obtained for answers to ALL questions.

The marks for the parts of questions are shown in round brackets, e.g. **(2)**.

There are 9 questions in this question paper. The total mark for this paper is 75.

**Advice to Candidates**

You must ensure that your answers to parts of questions are clearly labelled.

You must show sufficient working to make your methods clear to the Examiner.

Answers without working may not gain full credit.

**1.** Given that

tan *θ* ° = *p*, where *p* is a constant, *p* ≠ ±1,

use standard trigonometric identities, to find in terms of *p*,

(*a*) tan 2*θ* °,

**(2)**

(*b*) cos *θ* °,

**(2)**

(*c*) cot (*θ* – 45)°.

**(2)**

Write each answer in its simplest form.

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**2.** Given that

f(*x*) = 2e*x* – 5, *x* ∈ ℝ,

(*a*) sketch, on separate diagrams, the curve with equation

(i) *y* = f (*x*),

(ii) *y* = |f (*x*)|.

On each diagram, show the coordinates of each point at which the curve meets or cuts the axes.

On each diagram state the equation of the asymptote.

**(6)**

(*b*) Deduce the set of values of *x* for which f (*x*) = |f (*x*)|.

**(1)**

(*c*) Find the exact solutions of the equation |f (*x*)| = 2.

**(3)**

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**3.** g(*θ* ) = 4 cos 2*θ* + 2 sin 2*θ*.

Given that g(*θ* ) = *R* cos (2*θ* – *α*), where *R* > 0 and 0 < *α* < 90°,

(*a*) find the exact value of *R* and the value of *α* to 2 decimal places.

**(3)**

(*b*) Hence solve, for –90° < *θ* < 90°,

4 cos 2*θ* + 2 sin 2*θ*  = 1,

giving your answers to one decimal place.

**(5)**

Given that *k* is a constant and the equation g(*θ* ) = *k* has no solutions,

(*c*) state the range of possible values of *k*.

**(2)**

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**4.** Water is being heated in an electric kettle. The temperature, *θ* °C, of the water *t* seconds after the kettle is switched on, is modelled by the equation

*θ* = 120 – 100e–*λ*t, 0 ≤ *t* ≤ *T*.

(*a*) State the value of *θ* when *t* = 0.

**(1)**

Given that the temperature of the water in the kettle is 70 °C when *t* = 40,

(*b*) find the exact value of *λ*, giving your answer in the form , where *a* and *b* are integers.

**(4)**

When *t* = *T*, the temperature of the water reaches 100 °C and the kettle switches off.

(*c*) Calculate the value of *T* to the nearest whole number.

**(2)**

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**5*.***The point *P* lies on the curve with equation

*x* = (4*y* – sin 2*y*)2.

Given that *P* has (*x*, *y*) coordinates , where *p* is a constant,

(*a*) find the exact value of *p*.

**(1)**

The tangent to the curve at *P* cuts the *y-*axis at the point *A*.

(*b*) Use calculus to find the coordinates of *A*.

**(6)**

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**6.**



**Figure 1**

Figure 1 is a sketch showing part of the curve with equation *y* = 2*x* + 1 – 3 and part of the line with equation *y* = 17 – *x*.

The curve and the line intersect at the point *A*.

(*a*) Show that the *x-*coordinate of *A* satisfies the equation

*x* =  –1.

**(3)**

(*b*) Use the iterative formula

*xn* + 1=  –1, *x*0 = 3,

to calculate the values of *x*1, *x*2 and *x*3, giving your answers to 3 decimal places.

**(3)**

(*c*) Use your answer to part (*b*) to deduce the coordinates of the point *A*, giving your answers to one decimal place.

**(2)**

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**7.**

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**Figure 2**

Figure 2 shows a sketch of part of the curve with equation

g(*x*) = *x*2(1 – *x*)e–2*x*, *x* ≥ 0.

(*a*) Show that g*'* (*x*) = f(*x*)e–2*x*, where f(*x*) is a cubic function to be found.

**(3)**

(*b*) Hence find the range of g.

**(6)**

(*c*) State a reason why the function g–1(*x*) does not exist.

**(1)**

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**8.** (*a*) Prove that

sec 2*A* + tan 2*A* ≡ , *A* ≠ , *n* ∈ℤ.

**(5)**

(*b*) Hence solve, for 0 ≤ *θ* < 2*π*,

sec 2*θ* + tan 2*θ* = .

Give your answers to 3 decimal places.

**(4)**

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**9.** Given that *k* is a **negative** constant and that the function f(*x*) is defined by

f (*x*) = 2 – , *x* ≥ 0,

(*a*) show that f (*x*) = .

**(3)**

(*b*) Hence find f *'* (*x*), giving your answer in its simplest form.

**(3)**

(*c*) State, with a reason, whether f (*x*) is an increasing or a decreasing function.

Justify your answer.

**(2)**

**TOTAL FOR PAPER: 75 MARKS**

**END**