Edexcel GCE
Core Mathematics C3
Gold Level G4
(Question Paper)

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Paper Reference(s)

6665/01

Edexcel GCE

Core Mathematics C3

Gold Level (Hardest) G4

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Green)	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, differentiation and integration, or have retrievable mathematical formulas 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.
There are 8 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 gain no credit.

Suggested grade boundaries for this paper:

A*	A	B	C	D	E
57	50	43	36	29	21

1. Find the exact solutions to the equations

(*a*) $\ln x + \ln 3 = \ln 6$,

(2)

(*b*) $e^x + 3e^{-x} = 4$.

(4)

June 2007

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2. A curve C has equation

$$y = e^{2x} \tan x, \quad x \neq (2n+1)\frac{\pi}{2}.$$

(*a*) Show that the turning points on C occur where $\tan x = -1$.

(6)

(*b*) Find an equation of the tangent to C at the point where $x = 0$.

(2)

January 2008

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3. Given that

$$2 \cos (x + 50)° = \sin (x + 40)°.$$

(*a*) Show, without using a calculator, that

$$\tan x° = \frac{1}{3} \tan 40°.$$

(4)

(*b*) Hence solve, for $0 \leq \theta < 360$,

$$2 \cos (2\theta + 50)° = \sin (2\theta + 40)°,$$

giving your answers to 1 decimal place.

(4)

June 2013

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4. Find the equation of the tangent to the curve $x = \cos(2y + \pi)$ at $\left(0, \dfrac{\pi}{4}\right)$.

Give your answer in the form $y = ax + b$, where a and b are constants to be found.

(6)

January 2009

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5. Given that

$$x = \sec^2 3y, \qquad 0 < y < \frac{\pi}{6},$$

(*a*) find $\dfrac{dx}{dy}$ in terms of y.

(2)

(*b*) Hence show that

$$\frac{dy}{dx} = \frac{1}{6x(x-1)^{\frac{1}{2}}}.$$

(4)

(*c*) Find an expression for $\dfrac{d^2y}{dx^2}$ in terms of x. Give your answer in its simplest form.

(4)

June 2013

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6. (*a*) (i) By writing $3\theta = (2\theta + \theta)$, show that

$$\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta.$$

(4)

(ii) Hence, or otherwise, for $0 < \theta < \dfrac{\pi}{3}$, solve

$$8 \sin^3 \theta - 6 \sin \theta + 1 = 0.$$

Give your answers in terms of π.

(5)

(*b*) Using $\sin(\theta - \alpha) = \sin\theta \cos\alpha - \cos\theta \sin\alpha$, or otherwise, show that

$$\sin 15° = \frac{1}{4}(\sqrt{6} - \sqrt{2}).$$

(4)

January 2009

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7. (*a*) Express $2 \sin \theta - 1.5 \cos \theta$ in the form $R \sin (\theta - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$.

Give the value of α to 4 decimal places.

(3)

(*b*) (i) Find the maximum value of $2 \sin \theta - 1.5 \cos \theta$.

(ii) Find the value of θ, for $0 \leq \theta < \pi$, at which this maximum occurs.

(3)

Tom models the height of sea water, H metres, on a particular day by the equation

$$H = 6 + 2 \sin \left(\frac{4\pi t}{25} \right) - 1.5 \cos \left(\frac{4\pi t}{25} \right), \quad 0 \leq t < 12,$$

where t hours is the number of hours after midday.

(*c*) Calculate the maximum value of H predicted by this model and the value of t, to 2 decimal places, when this maximum occurs.

(3)

(*d*) Calculate, to the nearest minute, the times when the height of sea water is predicted, by this model, to be 7 metres.

(6)

June 2010

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8. Given that

$$\frac{\mathrm{d}}{\mathrm{d}x}(\cos x) = -\sin x,$$

(*a*) show that $\frac{\mathrm{d}}{\mathrm{d}x}(\sec x) = \sec x \tan x$.

(3)

Given that $x = \sec 2y$,

(*b*) find $\frac{\mathrm{d}x}{\mathrm{d}y}$ in terms of y.

(2)

(*c*) Hence find $\frac{\mathrm{d}y}{\mathrm{d}x}$ in terms of x.

(4)

January 2011

TOTAL FOR PAPER: 75 MARKS

END