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| **Pearson Edexcel Level 3** |
| **GCE Mathematics** **Advanced Level****Paper 1 or 2: Pure Mathematics** |
| **Practice Set 4** **Time: 2 hours** | **Paper Reference(s)** |
| **9MA0/01 or 9MA0/02** |
| **You must have:** **Mathematical Formulae and Statistical Tables, calculator** |

**Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for algebraic manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.**

**Instructions**

• Use black ink or ball-point pen.

• If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).

• Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.

• Answer the questions in the spaces provided – *there may be more space than you need*.

• You should show sufficient working to make your methods clear. Answers without working may not gain full credit.

• Inexact answers should be given to three significant figures unless otherwise stated.

**Information**

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

• There are xx questions in this paper. The total mark is 100.

• The marks for each question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

**Advice**

• Read each question carefully before you start to answer it.

• Try to answer every question.

• Check your answers if you have time at the end.

• If you change your mind about an answer, cross it out and put your new answer and any working underneath.

**Answer ALL questions.**

1. 

Find the values of the constants *A*, *B* and *C*.

**(6 marks)**

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**2.** A curve *C* has equation for *x* > 0

Find the exact value ofat the point *C* with coordinates (2, 4).

**(5 marks)**

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**3.** (a) Show that  by expanding and  using the compound-angle formulae.

**(3 marks)**

(b) Hence find.

**(3 marks)**

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**4.** The temperature of a mug of coffee at time *t* can be modelled by the equation

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where is the temperature, in °C, of the coffee at time *t* minutes after the coffee was poured into the mug and  is the room temperature in °C.

Using the equation for this model,

(a) explain why the initial temperature of the coffee is independent of the initial room temperature.

**(2 marks)**

(b) Calculate the temperature of the coffee after 10 minutes if the room temperature is 20 °C.

**(2 marks)**

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**5.** Prove by contradiction that if *n* is odd, *n*3+ 1 is even.

**(5 marks)**

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**6.** A curve *C* has parametric equations,,.

Show that a cartesian equation of *C* isfor a suitable domain which should be stated.

**(4 marks)**

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**7.** An infinite geometric series has first four terms The series is convergent.

(a) Find the set of possible values of *x* for which the series converges.

**(2 marks)**

Given that ,

(b) calculate the value of *x*.

**(3 marks)**

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**8.** , where *x* is in radians.

(a) Show that f(*x*) = 0 has a root *α* between *x* = 1.9 and *x* = 2.0.

**(2 marks)**

Using *x*0 = 1.95 as a first approximation,

(b) apply the Newton–Raphson procedure once to f(*x*) to find a second approximation to *α*, giving your answer to 3 decimal places.

**(5 marks)**

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**9.** Given that, find the values of *a*, *b* and *c*.

**(6 marks)**

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**10.** Use proof by contradiction to showthat there are no positive integer solutions to the statement

 **(5 marks)**

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**11.** The function g(*x*) is defined by, *x*∈ℝ, *x* > 4.

 Find g−1(*x*) and state its domain and range.

**(6 marks)**

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**12. **.

Given that f (*x*) can be expressed in the form , find the values of *A*, *B* and *C*.

**(6 marks)**

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**13** The curve *C* has equation.

(a) Show that *C* is concave on the interval [–5, –3].

**(3 marks)**

(b) Find the coordinates of the point of inflection.

**(3 marks)**

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**14** Find .

**(4 marks)**

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**15** .

(a) Find the values of the constants *A*, *B* and *C*.

**(6 marks)**

(b) Hence, or otherwise, expandin ascending powers of *x*, as far as the *x*2 term.

**(6 marks)**

(c) Explain why the expansion is not valid for.

**(1 mark)**

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**16** A large cylindrical tank has radius 40 m. Water flows into the cylinder from a pipe at a rate of 4000π m3 min−1. At time *t*, the depth of water in the tank is *h* m. Water leaves the bottom of the tank through another pipe at a rate of 50π*h* m3 min−1.

(a) Show that *t* minutes after water begins to flow out of the bottom of the cylinder, .

 **(6 marks)**

When *t* = 0 min, *h* = 50 m.

(b) Find the exact value of *t* when *h* = 60 m.

**(6 marks)**

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**TOTAL FOR PAPER IS 97 MARKS**