



Prifysgol Cymru
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University of Wales
Trinity Saint David

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 4

LEFEL 4

**EXAMINATION PERIOD
JULY 2022**

**MODULE CODE: ACHA4000
ANALYTICAL METHODS**

TIME: 1 ½ HOURS

(PLUS HALF AN HOUR TO SUBMIT SOLUTIONS – 2 HOURS IN TOTAL)

ANSWER ALL QUESTIONS

Equipment or materials required –

Calculators allowed

Formula booklet provided

SHOW ALL WORKINGS

IMPORTANT INSTRUCTIONS FOR ONLINE EXAMINATIONS:

- *You will need to submit a digital photograph or scan of each page of workings, preferably all in one Word document*
- *Please submit these to Moodle (underneath where you accessed the exam paper)*
- *Put the time, date, module code and your student number at the top of each page*
- *Number each page 'x of y'*
- *If you have any issues, email richard.sutton@uwtsd.ac.uk*

QUESTION ONE

a) Solve the following equations, using the appropriate method, for x :

(i) $\frac{(x+5)}{2} + \frac{(x+7)}{6} = \frac{x}{3}$

(ii) $2 \ln(x + 3) = \ln(x + 8) + \ln(x + 5)$

(iii) $3^{x+2} = 4 \times 2^x$

(11 marks)

b) Factorise the following algebraic expressions **completely**:

(i) $4P^2Q^2 - 4P^2Q^5 + 2P^2Q$

(ii) $r^2 - t^2$

(6 marks)

c) Solve the following quadratic equations **by using the factorisation method**:

(i) $x^2 + 8x + 15 = 0$

(ii) $x^2 + 9x + 14 = 0$

(6 marks)

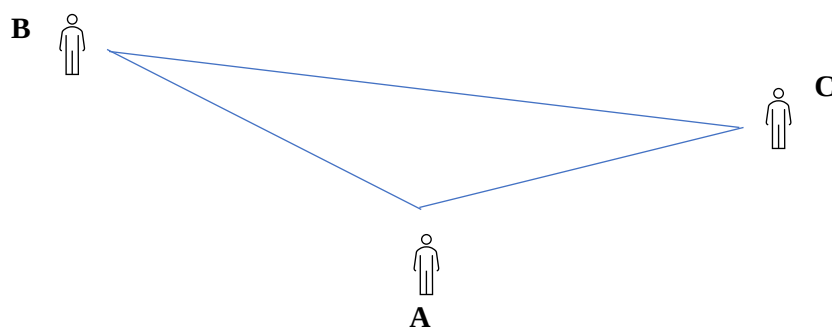
QUESTION TWO

The following people are testing some distance measuring apparatus. If the angle at point A is 62° , the angle at point B is 38° and the distance between person A and C is 35 metres, calculate:

(i) The angle at C

(ii) The distance between person A and person B

(iii) The distance between person B and person C



Triangle not drawn to scale.

(6 marks)

QUESTION THREE

a) Solve the following trigonometric equations for $0^\circ \leq x \leq 360^\circ$:

(i) $\cos x = 0.2$

(ii) $-5 \sin x = 2$

(5 marks)

QUESTION FOUR

a) Given the following complex numbers, $z_1 = 2 + 9j$, $z_2 = 1 - 5j$, calculate the following, **expressing your answers in rectangular form:**

(i) $z_1 + z_2$ (ii) $z_1 - \bar{z}_2$ (iii) $\frac{z_1}{z_2}$

(7 marks)

b) Solve the following quadratic equation, **expressing your answers in Polar Form:**

$$4x^2 = -x - 10$$

(10 marks)

c) Use de Moivre's theorem to calculate the following, **expressing your answer in rectangular form:**

(i) $(2 + 7j)^4$

(7 marks)

QUESTION FIVE

a) Find the first derivative of the following functions:

(i) $y = 9x^2 - 5x + e^x$

(ii) $y = (x - 5)^2$

(iii) $y = \sqrt{x} + \frac{1}{x^4}$

(iv) $y = \sin 4x + \cos 8x + \tan x$

(v) $y = x^7 \cos x$

(vi) $y = \frac{\sin 2x}{e^{5x}}$

(vii) $y = (x^3 - 8x + 1)^3$

(22 marks)

QUESTION SIX

a) Integrate the following:

(i) $\int x^3 + x^2 + 2x - 1 \, dx$

(ii) $\int (x + 8)(x^2 + 1) \, dx$

(iii) $\int_2^5 (x + 5)^2 \, dx$

(iv) $\int 4 \cos 2x + \sin x \, dx$

(20 marks)

TOTAL MARKS: 100

End of paper.