



**Prifysgol Cymru**  
Y Drindod Dewi Sant  
**University of Wales**  
Trinity Saint David

## Examination Answer Books

12 Pages

### Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.

Complete, fold and seal  
(see note 2 below)

SURNAME:

Low E

FORENAME(S):

NATHAN

WILLIAM

|   |                                  |                                 |
|---|----------------------------------|---------------------------------|
| 1 | Student Number                   | 1910544<br>190                  |
| 2 | Title of Examination Paper       | MATHS                           |
| 3 | Module Code                      | ADAC 4008                       |
| 4 | Date and Time of Examination     | 12 <sup>th</sup> MARCH<br>09:30 |
| 5 | Examination Venue                | 208                             |
| 6 | Seat Number                      |                                 |
| 7 | Number of Answer Books handed in |                                 |

[illegible]

Q1 i

$$f(x) = 6x^{-3} + 2$$

$$f'(x) = -18x^{-4} + 0$$

(7.5)

$$\frac{4.5}{3.0}$$

ii

$$f(x) = -4xe^{2x} - 9x$$

$$f'(x) = -8xe^{2x} - 9$$

(1)

iii

$$f(x) = \sin(5x^3 + x^2)$$

$$f'(x) = \cos(5x^2 + 2x)$$

$$(15x^2 + 2x)$$

iv

$$f(x) = \frac{(5x+3)^2}{(3x^2+2x)}$$

(0)

$$f'(x) = \frac{5^2}{3x+2} = \frac{25}{3x+2}$$

Q2

$$y = 2x^3 - 9x^2 + 12$$

$$\frac{dy}{dx} = \frac{2x^4}{4} - \frac{9x^3}{3} + 12x + C$$

$$= \frac{1}{2}x^4 - 3x^3 + 12x + C$$

(D)

$$\frac{0}{10}$$

Q3 i

$$\int (12x^3 - 4x^{-2}) dx$$

$$u = 12x^3$$

$$v = -4x^{-2}$$

~~du~~  
~~dx~~

$$\frac{12x^4}{4} + \frac{4x}{1}$$

$$3x^4 + 4x$$

(10)

(14/30)

ii

$$\int \frac{e^x}{1+e^x} dx$$

(0)

$$\frac{e^x}{x+e^x} \rightarrow \frac{1}{x} \rightarrow \ln|x| + C$$

iii

$$\int \left( \frac{2}{x} + 4 + \ln 3 \right) dx$$

(1)

$$2\ln|x| + C + 4x + \frac{1}{3}$$

Q4 i

$$I = \int_3^6 (3x^2 + x^3) dx$$

(2/10)

$$\frac{3x^3}{3} + \frac{x^4}{4} \rightarrow x^3 + \frac{x^4}{4}$$

$$x=6 \quad 6^3 + \frac{6^4}{4} = 540$$

$$x=3 \quad 3^3 + \frac{3^4}{4} = 47.25$$

Q5

$$z_1 = \frac{3-2j}{2+j}$$

$$z_2 = \frac{3+2j}{1-2j}$$

$$z_1 - z_2 = \frac{3-2j}{2+j} - \frac{3+2j}{1-2j}$$

$$= \frac{(3-2j)(1-2j) - (3+2j)(2+j)}{(2+j)(1-2j)}$$

$$= \frac{3-6j-2j+4j^2 - 6-13j-4j-2j^2}{2-4j+j-2j^2}$$

$$= \frac{-j+3-8-13j}{2-3j}$$

(1)

$$i) \quad z_1 = |z_1| = \sqrt{2^2 + 1^2} = 2.236$$

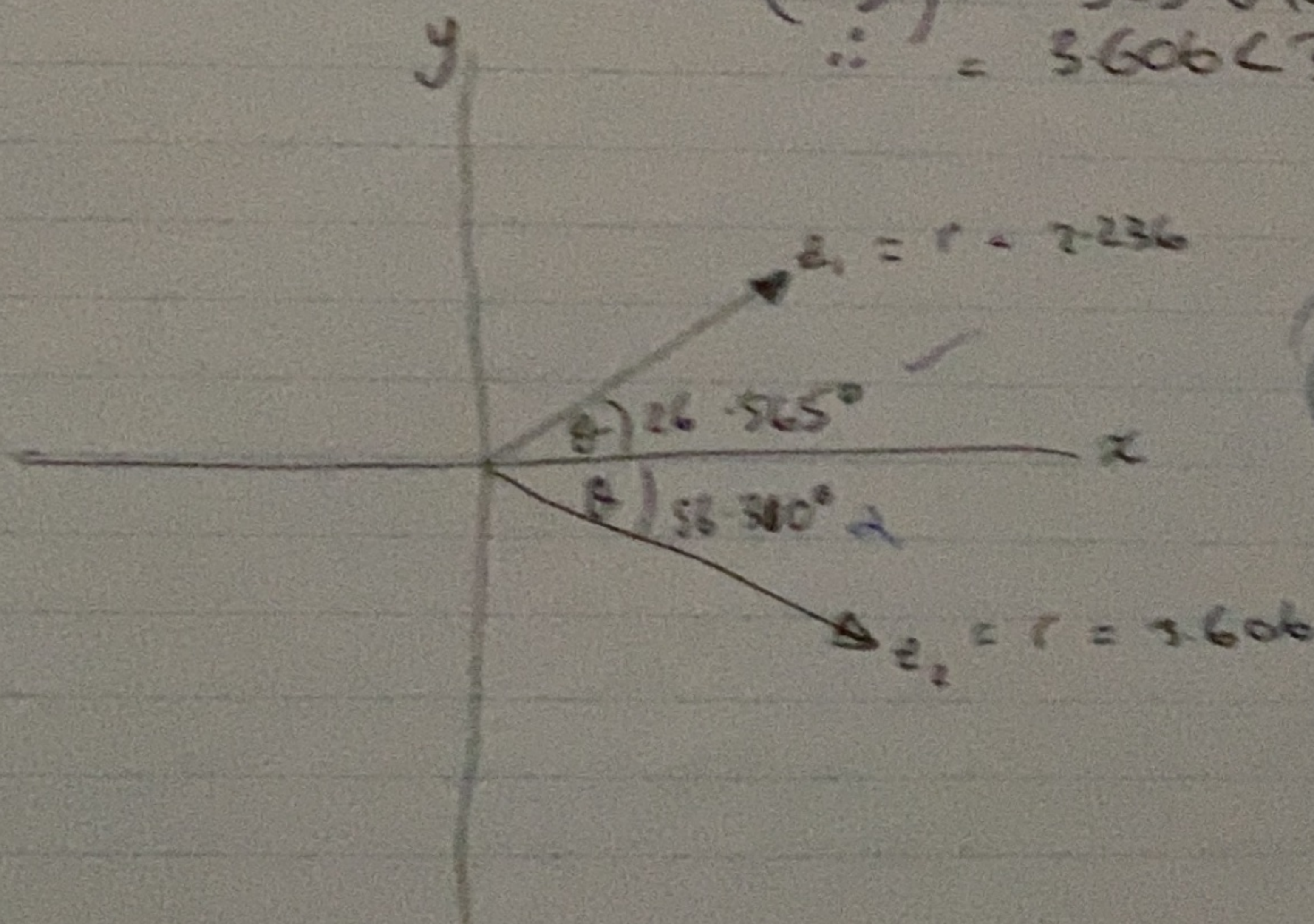
$$\tan^{-1}\left(\frac{1}{2}\right) = 26.565^\circ$$

$$\therefore = 2.236 \angle 26.565$$

$$z_2 = |z_2| = \sqrt{3^2 + 2^2} = 3.606$$

$$\tan^{-1}\left(\frac{2}{3}\right) = 33.690^\circ$$

$$\therefore = 3.606 \angle 33.690$$



iii

$$z = (\sqrt{3} + j)^8$$

$$z^8 = \sqrt{3+1} = 2$$

0

$$\tan^{-1}\left(\frac{1}{3}\right) = 18.435^\circ$$

$$\therefore z^8 = 2^8 < 8 \times 18.435^\circ$$

iv

$$x^2 - 4x + 13 = 0$$

$$\begin{aligned} z_1 &= 2+3j \\ z_2 &= 2-3j \end{aligned}$$

$$z_1 \sqrt{2^2+3^2} = 3.606$$

$$z_2 \sqrt{2^2+3^2} = 3.606$$

$$\tan^{-1}\left(\frac{3}{2}\right) = 56.310^\circ$$

$$\tan^{-1}\left(-\frac{3}{2}\right) = -56.310^\circ$$

$$z_1 = 3.606 \angle 56.310^\circ$$

$$z_2 = 3.606 \angle -56.310^\circ$$

2

04  
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