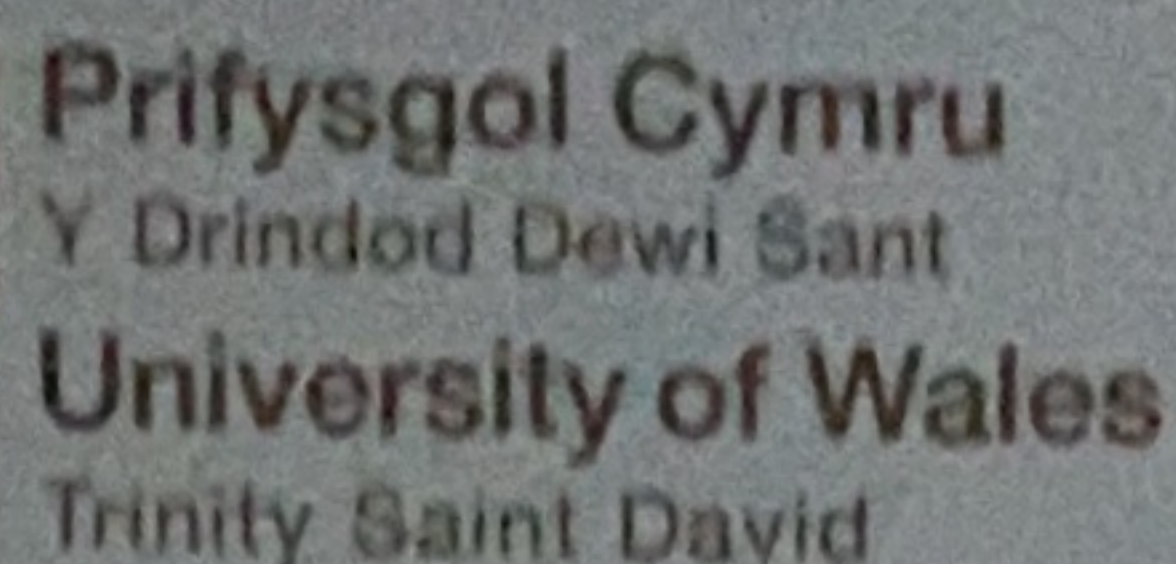



$$\frac{32.5}{100}$$

BOSWELL

John

12 Pages

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.

[illegible]

①

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

$$f'(x) = (-3) \times 6x^{-4} + 2$$

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

(7.5)

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

Product Rule

$$u = -4xe^{2x}$$

$$v = -9x$$

2

$$f'(x) = \frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$f'(x) = \frac{dy}{dx} = (-4xe^{2x}) \times \frac{-9x}{dx} + (-9) \times \frac{(-4xe^{2x})}{dx}$$

$$f'(x) = \frac{dy}{dx} = (-4xe^{2x}) \times -9 + (-9) \times (-4xe^{2x})$$

0

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

Product Rule
 $u = \sin$
 $v = (5x^3 + x^2)$

$$f'(x) = \frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$f'(x) = \frac{dy}{dx} = \sin x (5x^3 + x^2) + (5x^3 + x^2) \times \sin$$

$$f'(x) = \frac{dy}{dx} = \sin(15x^2 + x) + (5x^3 + x^2) \times \cos x$$

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

Quotient Rule
 $u = (5x+3)^2$
 $v = (3x^2+2x)$

$$f'(x) = \frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

2

$$f'(x) = \frac{dy}{dx} = \frac{(3x^2+2x) \times (5x+3)^2 - (5x+3)^2 \times (3x^2+2x)}{(3x^2+2x)^2}$$

$$v) \quad f'(x) = \frac{dy}{dx} = (3x^2 + 2x) \times \frac{2(5x+3)^3}{dx} - (5x+3)^2 \times \frac{(6x+2)}{dx}$$

$$f'(x) = (3x^2 + 2x) \times (10x + 6) - (5x+3)^2 \times (6x+2)$$

②

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

①

$$\frac{dy}{dx} = 6x^2 - 18x + 12$$

Quadratic Formula

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 6x^2$$

$$b = -18x$$

$$c = 12$$

$$\frac{6x^2 \pm \sqrt{6x^2 - 4(-18)12}}{2 \times 6x^2}$$

ANSWER TO QUADRATIC FORMULA GIVES US TWO NUMBERS

WHICH ARE THE MINIMUM + MAXIMUM

③

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

10

$\left(\frac{12x^4}{4} - \frac{4x^{-1}}{-1} \right) + C$

$\frac{10}{30}$

④

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

$$\int_3^6 \left(\frac{3x^3}{3} + \frac{x^4}{4} \right) dx$$

$$\frac{06}{10}$$

Put 3 in as x

$$\left(\frac{3 \times 3^3}{3} + \frac{3^4}{4} \right)$$

→ WORKS OUT LOWER NUMBER

Put 6 in as x

$$\left(\frac{3 \times 6^3}{3} + \frac{6^4}{4} \right)$$

→ WORKS OUT HIGHER NUMBER

HIGHER NUMBER - LOWER NUMBER

$$\left(\frac{3 \times 216}{3} + \frac{1296}{4} \right) - \left(\frac{3 \times 27}{3} + \frac{81}{4} \right)$$

$$= \frac{648}{3} + \frac{1296}{4} - \frac{81}{3} + \frac{81}{4}$$

$$= 216 + 324 - 18 + 20.25$$

④

CONT

540

Ans =

$$540 - 38.25 = 501.75$$

$$\text{Ans} = 501.75$$

5

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

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

$$z_1 - z_2$$

$$\frac{(3-3)(-2j-2j)}{(2-1)(j-2j)} = \frac{0-4j}{1-1j}$$

α

~~XXXXXXXXXXXX~~

$$\text{Ans} = \frac{0-4j}{1-1j}$$

ii)

$$z_1 =$$

$$z_2 =$$

ARGAND

AN

-3 -4

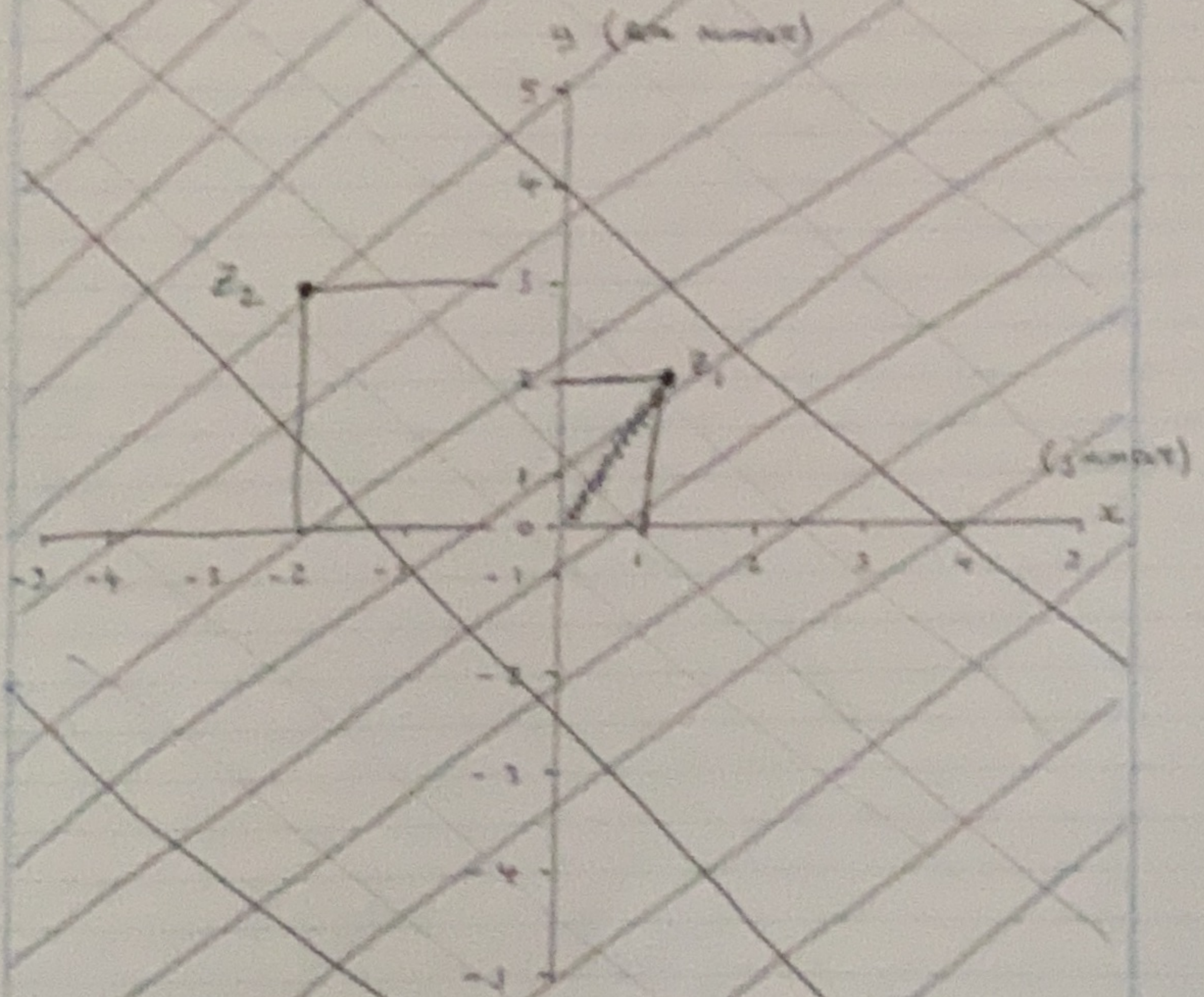
$$z_1 = z + 1j$$

$$z_2 = 3 - z_1$$

Answer:

The complex number z_2 is

$$z_1 = z + 1j \quad \text{and} \quad z_2 = 3 - z_1$$



iii) DE MOIVRE'S THEOREM - $z = (\sqrt{3} + j)^8$

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

0

FIRST FIND POLAR FORM.

$(r < \theta)$

5
11)

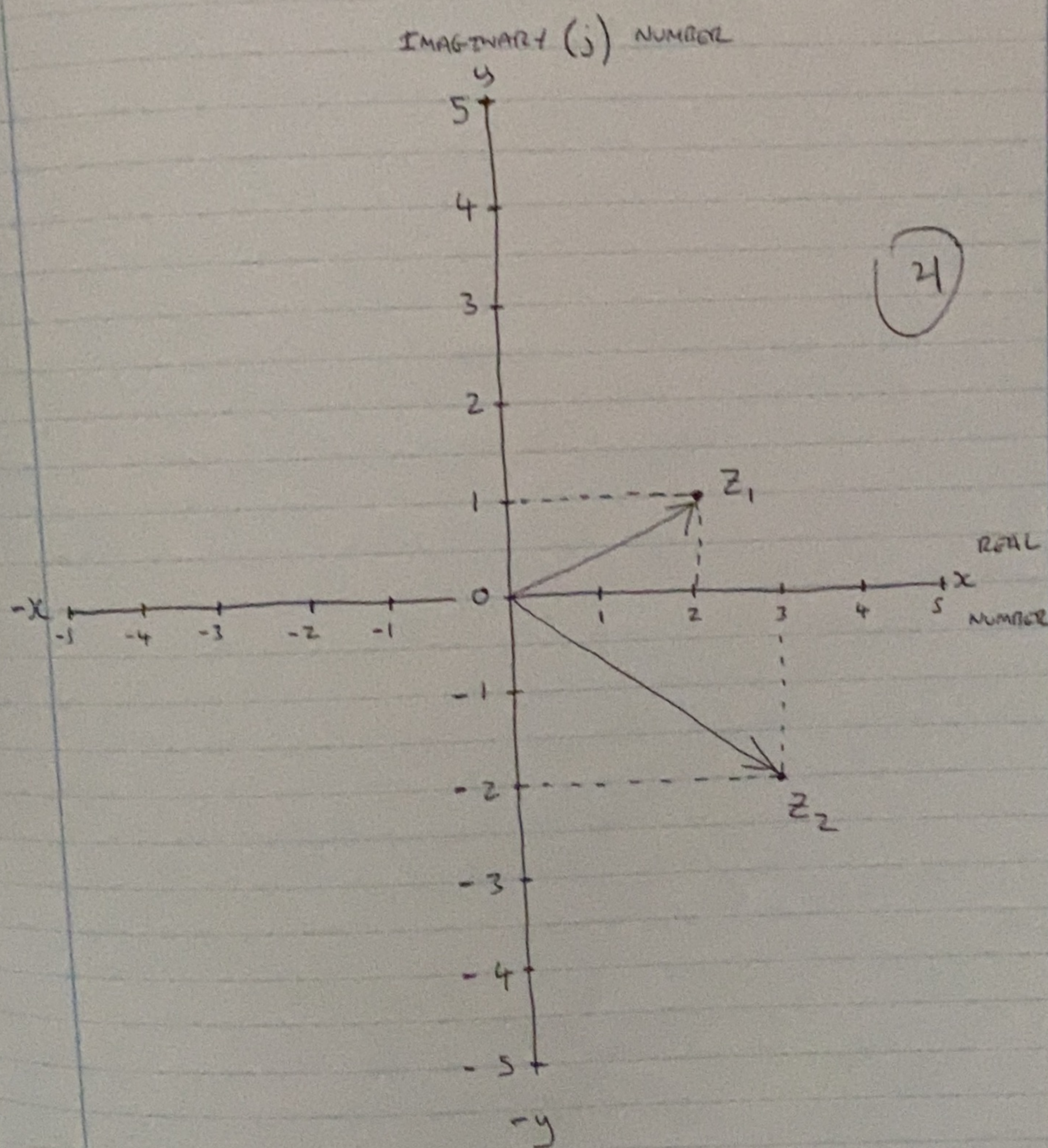
ARGAND DIAGRAM

~~$z = 3 - 2j$~~ $z_1 = 2 + 1j$ $z_2 = 3 - 2j$

AN ARGAND DIAGRAM SHOWING THE COMPLEX NUMBERS

$z_1 = 2 + 1j$ AND $z_2 = 3 - 2j$

$$\frac{64}{2^3}$$



5

iv)

QUADRATIC FORMULA

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$