(a) Write down the value of the real ro	ot of the equa	tion
---	----------------	------

$$x^3 - 64 = 0. (1)$$

(b) Find the complex roots of $x^3 - 64 = 0$, giving your answers in the form a + ib, where a and b are real.

(4)

(c) Show the three roots of $x^3 - 64 = 0$ on an Argand diagram.

(2) (Total 7 marks)

7 (i) Find the roots of the equation

$$z^2 + (2\sqrt{3})z + 4 = 0$$
,

giving your answers in the form x + iy, where x and y are real.

[2]

[3]

(ii) State the modulus and argument of each root.

(iii) Showing all your working, verify that each root also satisfies the equation

$$z^6 = -64$$
. [3]

Given that 2 and 5 + 2i are roots of the equation

$$x^3 - 12x^3 + cx + d = 0,$$
 $c, d \in \mathbb{R},$

(a) write down the other complex root of the equation.

(1)

(b) Find the value of c and the value of d.

(5)

(c) Show the three roots of this equation on a single Argand diagram.

(2)

(Total 8 marks)

2.
$$f(x) = 2x^3 - 5x^2 + px - 5, p \in \mathbb{R}$$

Given that 1 - 2i is a complex solution of f(x) = 0,

(a) write down the other complex solution of f(x) = 0,

(1)

(b) solve the equation f(x) = 0,

(6)

(c) find the value of p.

(2)

(Total 9 marks)

Given that 3 – 2i is a solution of the equation

$$x^4 - 6x^3 + 19x^2 - 36x + 78 = 0$$

(a) solve the equation completely,

(7)

(b) show on a single Argand diagram the four points that represent the roots of the equation.

(2)

(Total 9 marks)

26. (a) By factorisation, show that two of the roots of the equation $x^3 - 27 = 0$ satisfy the quadratic equation $x^2 + 3x + 9 = 0$.

(2)

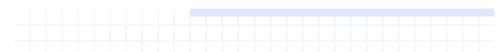
(b) Hence, or otherwise, find the three cube roots of 27, giving your answers in the form a + ib, where a, b ∈ R.

(3)

(c) Show these roots on an Argand diagram.

(2)

(Total 7 marks)



21. Given that 3 + i is a root of the equation f(x) = 0, where

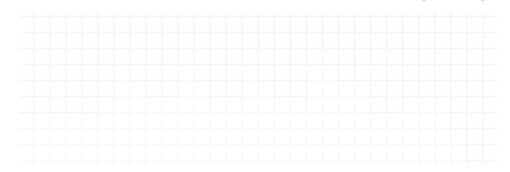
$$f(x) = 2x^3 + ax^2 + bx - 10,$$
 $a, b \in \mathbb{R}$,

(a) find the other two roots of the equation f(x) = 0,

(4)

(b) find the value of a and the value of b.

(3)



- 19. Given that 1 + 3i is a root of the equation $z^3 + 6z + 20 = 0$,
 - (a) find the other two roots of the equation,

(3)

(b) show, on a single Argand diagram, the three points representing the roots of the equation,

(1)

(c) prove that these three points are the vertices of a right-angled triangle.

(2) (Total 6 marks)