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⏱ 35 mins   ❓ 4 questions

3.1 Roots of Polynomials

3.1.1 Roots of Polynomials / 3.1.2 Linear Transformations of Roots

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Total Marks   **/35**

1 $$f(z) = z^4 + az^3 + 6z^2 + bz + 65$$

where a and b are real constants.

Given that $z = 3 + 2i$ is a root of the equation $f(z) = 0$, show the roots of $f(z) = 0$ on a single Argand diagram.

(9 marks)

2 The roots of the equation

$$x^3 - 8x^2 + 28x - 32 = 0$$

are α, β and γ

Without solving the equation, find the value of

(i) $\dfrac{1}{\alpha} + \dfrac{1}{\beta} + \dfrac{1}{\gamma}$

(ii) $(\alpha + 2)(\beta + 2)(\gamma + 2)$

(iii) $\alpha^2 + \beta^2 + \gamma^2$

(8 marks)

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3 (a)

$$f(z) = 3z^3 + pz^2 + 57z + q$$

where p and q are real constants.

Given that $3 - 2\sqrt{2}\,i$ is a root of the equation $f(z) = 0$

    (a)   show all the roots of $f(z) = 0$ on a single Argand diagram,

(7 marks)

(b) (b)   find the value of p and the value of q.

(3 marks)

4 The roots of the equation

$$x^3 - 2x^2 + 4x - 5 = 0$$

are p, q and r.
Without solving the equation, find the value of

  (i) $\dfrac{2}{p} + \dfrac{2}{q} + \dfrac{2}{r}$

(ii) $(p - 4)(q - 4)(r - 4)$

(iii) $p^3 + q^3 + r^3$

(8 marks)