

NEW SOUTH WALES

Higher School Certificate

Mathematics Extension 2

Exercise 6/67

by James Coroneos*

- Express each of the following in both forms (x, y) and $x + iy$.
(i) $(3, 4)^{-1}$ (ii) $(-2, 5)^{-1}$ (iii) $(4, -1)^{-1} + (-1, -4)^{-1}$ (iv) $(2, -3)(-1, 1)^{-1}$
- If $z_1 = (\sqrt{2}, -\sqrt{3})$, $z_2 = (\sqrt{5}, 1)$ are number pairs, calculate
(a) z_1^2 (b) z_2^2 (c) $\frac{1}{z_1} \cdot \frac{1}{z_2}$ (d) $\frac{1}{z_1} - \frac{1}{z_2}$ (e) $z_1 z_2^{-1}$
Express each result in the form (x, y) and $x + iy$.
- Show that the system of ordered pairs (a, b) constitute a field, where the elements are real numbers. [Note that the additive and multiplicative identities are $(0, 0)$, $(1, 0)$ respectively, and the additive and multiplicative inverses of (a, b) are $(-a, -b)$, $(\frac{a}{a^2+b^2}, \frac{-b}{a^2+b^2})$ respectively.]



*Other resources by James Coroneos are available. Write to P.O. Box 25, Rose Bay, NSW, 2029, Australia, for a catalogue. TYPESET BY $\mathcal{A}\mathcal{M}\mathcal{S}$ -TEX.