

NEW SOUTH WALES

Higher School Certificate

Mathematics Extension 2

Exercise 11/67

by James Coroneos*

- If P represents the complex number z , sketch the locus of P if
 - $|z| = 4$
 - $|z| \leq 4$
 - $|z - 1| \leq 3$
 - $|z + 3i| < 1$
 - $|2z - 3| = 1$
 - $|z - 1 - 2i| = 4$
 - $\arg z = \pi/2$
 - $\arg z = -\pi/3$
 - $\Re(z) = 2$
 - $\Im(z) = -2$
 - $1 < |z| < 2$
 - $3 < |z| \leq 4$
 - $2 \leq |z| \leq 5$
 - $1 \leq |z + 2| \leq 2$
 - $2 \leq \Im(z) < 3$
 - $2 < \Re(z) \leq 3$
 - $0 < \arg z < \pi/6$
 - $\pi/2 \leq \arg z \leq 2\pi/3$
 - $|\frac{1}{z}| \geq \frac{1}{9}$
 - $1 < |z - 1 + i| < 2$
 - $\Re(z^2) = 0$
 - $\Im(z^2) = 2$
 - $\Re(z) = |z - 1|$
 - $0 < \Re(iz) \leq 2$
 - $\Re(z - iz) \geq 2$
- Mark in *clearly* on the Argand diagram, the regions of the z plane satisfied by:
 - $\Re(z) \geq 1$ and $1 \leq \Im(z) \leq 2$
 - $\Re(z) \geq 1$ or $1 \leq \Im(z) \leq 2$
 - $3 < |z| < 4$ and $\pi/3 < \arg z < 2\pi/3$
 - $3 < |z| < 4$ or $\pi/3 < \arg z < 2\pi/3$
 - $|z| \leq 3$ and $\pi/4 < \arg z \leq \pi$
 - $|z| < 4$ or $\pi/4 \leq \arg z < 3\pi/4$
 - $2 < |z| \leq 3$ and $\Im(z) > 1$
 - $-1 \leq \Re(z) \leq 1$ or $\Im(z) \leq 3$
 - $\Im(z) \geq 1$ and $0 \leq \arg z \leq \pi/4$
 - $\Im(z) < 2$ or $\pi/3 \leq \arg z \leq 2\pi/3$
 - $1 \leq \Re(z) \leq 2$ and $2 \leq \Im(z) \leq 3$
 - $\Re(z) < 2$ or $-\pi/3 < \arg z \leq \pi/3$
 - $1 < |z + i| < 2$ and $\pi < \arg z < 3\pi/2$
 - $|z + i| = 1$ or $0 \leq \Re(z) \leq 1$
 - $-4 \leq \Im(z) \leq 4$ and $|z| \geq 5$
 - $-4 \leq \Im(z) \leq 4$ or $|z| \geq 5$
 - $|2z - 3| < 2$ and $\pi/6 < \arg z < \pi/2$
 - $|z| > 2$ or $|z| < 1$
- Consider the roots of the quadratic equation $z^2 + az + 9 = 0$. If z_1 and z_2 are the roots of this equation and 'a' is real, draw the locus traced out by the two roots in the complex plane as a takes on all real values. [Hint: consider $a^2 \geq 36$; $a^2 < 36$]



*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.