3: A complex number z is represented by the point P on an Argand diagram where $|z| = 1$

(a) Sketch the locus of P as z varies.

(1)

The transformation T from the z–plane, where $z = x + iy$, to the w–plane, where $w = u + iv$, is given by

$$w = \frac{9iz - i}{z + 1} \qquad z \neq -1$$

Given that the image under T of the locus of P in the z–plane, where $z \neq -1$, is the line l in the w–plane,

(b) determine, in simplest form, a Cartesian equation for l

(5)

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Question 3 continued

(Total for Question 3 is 6 marks)