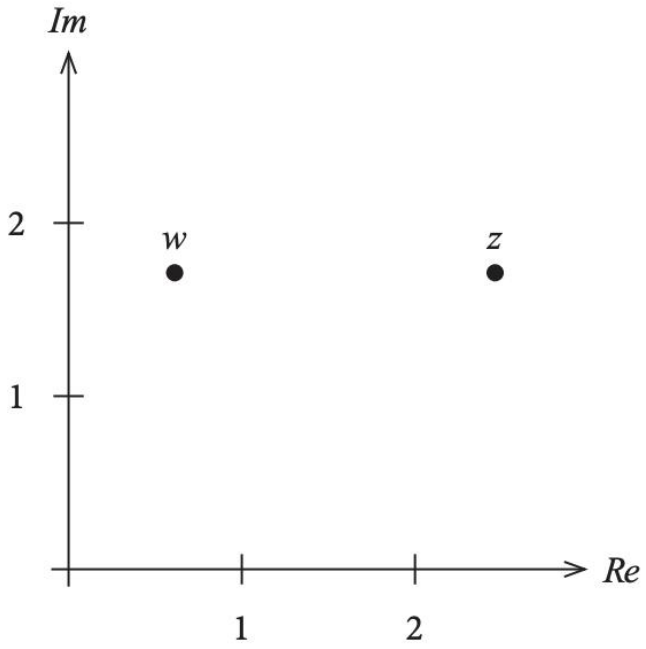
Question 12 **(6 marks)**

Complex numbers z and w are shown in the Argand diagram below. It is known that:

$|z| = 3,\ Arg\,(z) = \theta$ where $0 < \theta < \frac{\pi}{4}$

$w = z - k$ such that $Arg\,(w) = 2\theta$ where $Im\,(k) = 0,\ k > 0.$



(a) Represent the given information on the Argand diagram. (3 marks)

A spare diagram is provided at the end of this Question/Answer booklet. If you need to use it, cross out this attempt and indicate that you have redrawn it on the spare diagram.

(b) Determine a simplified expression for k in terms of θ. Justify your answer. (3 marks)