**1** The complex numbers *w* and *z* are given by *w* = 2 + *k*i and *z* = –2*k* + 4i, where *k* is a real constant. Given that , find the exact value of *k*. **(4 marks)**

**2** 

**a** Express *z* in the form ,  **(3 marks)**

**b** Given that  and , express  in the form ,  **(3 marks)**

**3** ****

**a** Find the Cartesian equation of this locus. **(4 marks)**

**b** Sketch the locus of *z*. Label the points of intersection with the real and imaginary axes. **(2 marks)**

**c** Find the exact least possible value of. Leave your answer in the form, where *a* is a rational number. **(3 marks)**

**4** A complex number *z* is represented by the point *Q* on the Argand diagram. Given that,

**a** sketch the locus of *Q*. **(2 marks)**

**b** Show that the minimum angle of  in the interval  is

 **(5 marks)**

**5** The region *R* in an Argand diagram is satisfied by the inequalities  and . Draw an Argand diagram and shade in the region *R*. **(6 marks)**

**6** Shade on an Argand diagram the set of points  **(6 marks)**