**1** Given that  and 

**a** Express  and  in the form  where *r* > 0 and  **(5 marks)**

**b** Hence, or otherwise, calculate  and  giving your answers in the form  where *r* > 0 and  **(5 marks)**

**c** Display  and  on an Argand diagram. **(2 marks)**

**2** Use de Moivre’s theorem to fully simplify

**a**  **(1 mark)**

**b**  **(2 marks)**

**c**  **(3 marks)**

**3** Express  in terms of powers of , giving your answer in its simplest form. **(6 marks)**

**4** Solve, giving your answers, where appropriate, in the form *r*(cos *θ* + isin *θ*)   
where –π < θ ⩽ π

**a**  showing the solutions on an Argand diagram. **(6 marks)**

**b**  showing the solutions on an Argand diagram. **(6 marks)**

**5** A complex number *z* hasmodulus 1 and argument *θ*

**a** Show that  **(3 marks)**

**b** Hence show that

 **(6 marks)**

**c** Hence find the exact value of

 **(5 marks)**