**Self-assessment: 15 Complex numbers**

**1.** Solve the equation *z* + 2*z*\* = 4i − 1.

*(accessible to students on the path to grade 3 or 4) [5 marks]*

**2.** **Do not use a calculator to answer this question.**

Write  in the form *a* + *b*i.

*(accessible to students on the path to grade 5 or 6) [5 marks]*

**3.** **Do not use a calculator to answer this question.**

Find all the roots of the equation *z*3 = −4 + 4. Give your answers in the form *r*ei*θ*.

*(accessible to students on the path to grade 5 or 6) [8 marks]*

**4.** Given that *z* = cos *θ* + i sin *θ*,

(a) Show that  = 2i sin (*nθ*).

*(accessible to students on the path to grade 5 or 6)*

(b) Expand .

*(accessible to students on the path to grade 3 or 4)*

(c) Hence, or otherwise, show that .

*(accessible to students on the path to grade 7)*

*[12 marks]*