

**Difficulty guide for worksheet:***C-level or B-level exam problem:* 1, 3*A-level exam problem or challenge for extra study:* 2*beyond the scope and/or removed from syllabus:* none

1. For each complex number, find both the rectangular and polar forms.

(a)  $-2i$

(c)  $3 - 3i$

(e)  $-4$

(g)  $(-1 + i)^9$

(b)  $4e^{i\pi/6}$

(d)  $e^{-i\pi/8}$

(f)  $-\sqrt{3} - 3i$

(h)  $(3 - \sqrt{27}i)^{-4}$

2. Use DeMoivre's formula to derive a formula for  $\sin(4\theta)$  in terms of  $\sin(\theta)$  and  $\cos(\theta)$  only.

3. Find all complex solutions to the given equation. Write your answers in rectangular form.

(a)  $z^2 = -3i$

(c)  $z^6 = -64$

(e)  $z^5 = 1 + i$

(b)  $z^4 + 3z^2 = 4$

(d)  $z^4 + 81 = 0$

(f)  $e^{iz} = e^3$