BRIGIDINE COLLEGE RANDWICK

Extension 2 Mathematics

Assessment Task 1, 2009

(Time: 45 mins)

Directions to candidates:

- Write your **name** at the top of this question paper and each page to be handed in.
- All questions are to be attempted.
- All necessary working should be shown for every question.
- Full marks may not be awarded for careless or badly arranged work.

1. Simplify i^{2009} **1**

2. Let $z = a + ib$, where a and b are real. Find:

(i) $\text{Im}(4i - z)$. **2**

(ii) $\overline{(3iz)}$ in the form $x + iy$ where x and y are real **2**

(iii) $\tan\theta$ where $\theta = \arg(z^2)$ **2**

3. Express in modulus-argument form:

(i) $-1 + i$ **2**

(ii) $(-1 + i)^n$ **2**

4. (a) On the same diagram, draw a neat sketch of the locus specified by each of the following

(i) $|z - (3 + 2i)| = 2$ **2**

(ii) $|z + 3| = |z - 5|$ **2**

(b) Use your diagram from (a) to determine the values of k for which the simultaneous shown below have exactly one solution for z. **1**

$|z - (3 + 2i)| = 2$

$|z - 2i| = k$

5. (a) Express as a complex equation the following locus:

"The perpendicular bisector of AB given A is (-2, -1) and B is (1, 3)." **2**

(b) (*i*) If $z = x + iy$, simplify $\left|z^2 - (\bar{z})^2\right|$ **2**

(*ii*) Sketch the region $\left|z^2 - (\bar{z})^2\right| \geq 16$ **2**

6. (a) Evaluate $\int_1^3 \frac{4}{(2+x)^2}\,dx$ **2**

(b) Find $\int \sec^2 x \tan x \, dx$ **2**

(c) Evaluate $\int_1^2 \frac{11-2x}{(2x-1)(3-x)}\,dx$ **3**

2

7. (a) Find $\int \frac{2x}{x^2+6x+1}\,dx$

(b) Find $\int xe^{x^2}\,dx$ **2**

8. (*i*) Express $3 + x^2$ in the form $a^2 + x^2$. **1**

(*ii*) Hence, using the Table of Standard Integrals provided, find **1**

$\int \frac{2}{3+x^2}\,dx$