

STUDENT ID NO:

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

**AUSTRALIAN CATHOLIC UNIVERSITY  
STRATHFIELD CAMPUS (MOUNT SAINT MARY)  
SCHOOL OF ARTS & SCIENCES (NSW)**

**MID-SEMESTER TEST SEMESTER 2 2007**

<b>UNIT CODE:</b>	<b>MATH307</b>		
<b>UNIT TITLE:</b>	<b>Transformations and Symmetries</b>		
<b>LECTURER:</b>	<b>Bill Franzsen</b>	<b>DURATION:</b>	<b>1.5 hours</b>
<b>READING TIME:</b>	<b>10 minutes</b>	<b>WEIGHTING:</b>	<b>30%</b>
<b>NUMBER OF PAGES IN EXAMINATION PAPER (including this page):</b>	<b>3</b>		

**SPECIAL INSTRUCTIONS TO STUDENTS:**

There are 10 questions on 3 pages, including this page.

Complete, careful, correct answers to 8 questions will obtain full marks. The marks available for each question are indicated at the end of each question.

This examination is worth 40% of your final mark.

You must give reasons; if none are given then you will get no marks for that part of the question.

You may attempt any and all questions in any order you choose.

Non-programmable calculators are permitted.

This question paper must be handed in with your answers.

**EXAMINATION RULES**

▪Food and drink may not be brought into the examination room. (Special consideration may be granted upon application). ▪No bags or other cases of any kind are permitted at your desk. ▪Wallets and purses must be placed on the floor under your desk. ▪Mobile phones and watch alarms must be turned off.

**EXAMINATION PROCEDURES (University Handbook 5.2)**

▪If you are late, you will not be admitted 30 minutes after the start time of an examination. Latecomers are not allowed extra time. ▪ID cards must be brought into each examination, produced on demand and displayed prominently on desks. ▪Candidates must complete an attendance form at every examination. ▪No writing of any kind is permitted during reading time. ▪If a candidate becomes ill during the examination and cannot continue, the supervisor will note this. The student may apply for a deferred examination. ▪There must be no communication of any kind between candidates in the examination room. ▪All textbooks, dictionaries, calculators, notes, manuscripts, bags, other materials or devices, or special assistance, except those specifically authorised for the examination must be left outside the examination area. ▪You will not be permitted to leave until 30 minutes after the commencement of writing time. ▪If you wish to leave the examination early, you should raise your hand and remain seated until your papers are collected. You may then leave. ▪You will not be permitted to leave during the last 10 minutes of writing time. ▪You must remain seated until your examination paper is collected. ▪A candidate who commits an infringement of Examination Room Procedures is guilty of misconduct. The Supervisor may expel the candidate immediately from the examination room. ▪Misconduct involving cheating or collusion between students is considered a serious offence and may result in the candidate being expelled from the examination room. The Discipline Committee is also informed and penalties may be applied.

**EXAMINATION PAPERS MUST NOT BE REMOVED FROM THE EXAMINATION ROOM  
ALL UNUSED MATERIALS AND SCRAP PAPERS MUST BE LEFT ON THE CANDIDATE'S  
DESK**



6. Let  $l$  be the line with equation  $2x + 3y + 5 = 0$  and let  $P$  be the point  $(4, 13)$ . Find  $\sigma_l(P)$ . (20)

7. Let  $l$  be the line with equation  $2x - y + 3 = 0$  and let  $m$  be the line with equation  $3x - y + 4 = 0$ .  
**Either**

(i) find  $R$  and  $\theta$  such that  $\sigma_l\sigma_m = \rho_{R,\theta}$ , or

(ii) find  $\underline{u}$  such that  $\sigma_l\sigma_m = \tau_{\underline{u}}$ .

(30)

8. Show that if  $\rho$  is a rotation with fixed point  $P$  and  $l$  is any line through  $P$ , then there is a line,  $m$ , through  $P$  such that

$$\rho = \sigma_m\sigma_l.$$

(15)

9. Find all the numbers  $a$  such that  $\alpha(x, y) = (x^3 + ax, y)$  is a transformation.

(25)

10. Given the lines  $l: x - 3y - 7 = 0$  and  $m: x + 2y + 1 = 0$ , find a line  $n$  such that

$$\sigma_l\sigma_m = \sigma_n\sigma_l.$$

(40)