

MATH 2130 Section A01 Summer 2011 Term Test 1

You have 70 min to solve 5 problems. Please note

- Write your name/student id clearly
- Illegible work will have marks removed. If I have trouble reading your work, it will not be marked.
- Write only on one side of the paper in the space design for it. If you require more space, **CLEARLY** indicate that you are continuing on the back.
- The last page of the exam is for calculations or scrap work. You may remove it, but be careful not to remove the staple. This page will **NOT** be marked.
- No calculators or any outside materials other than a pencil are permitted.
- The examination is out of 40 marks. Question values are given in brackets beside each question.
- You must show your work unless otherwise indicated.

Good luck!

Surname: _____

Given Name: _____

Student ID: _____

1. Let l_1 be the line with symmetric equations

$$\frac{x-1}{2} = \frac{y+3}{3} = 4-z$$

and l_2 be the line of intersection of the planes

$$x + y + 5z = 2 \text{ and } y + 3z = 1.$$

- (a) Find parametric equations for the line l_2 . [4]

- (b) Determine whether l_1 and l_2 are intersecting, parallel or skew. [2]

(c) Find the distance between lines l_1 and l_2 . [6]

2. Find a vector representation for the curves of intersection of $z = \sqrt{4 - x^2 - y^2}$ and $x^2 + y^2 - 2y = 0$ directed so that z increases when x is positive. [6]

3. Let a curve C be defined by a position vector $\mathbf{r}(t) = \langle 2 \sin t, 2 \cos t, 3t \rangle$.

(a) Find the tangent vector. [3]

(b) Find the unit tangent vector. [2]

(c) Find the length of the curve C from the point $(0, 2, 0)$ to $(0, 2, 6\pi)$. [4]

4. Find the following limits, or show why they do not exist.

(a) $\lim_{(x,y) \rightarrow (0,0)} \frac{2xy}{x^2+3y^2}$ [4]

(b) $\lim_{(x,y) \rightarrow (0,0)} \frac{\sin(x^2+y^2)}{x^3+xy^2+2x^2+2y^2}$ [3]

5. Show that the function $f(x, y) = \frac{x^3y}{x-y}$ satisfies $x\frac{\partial f}{\partial x} + y\frac{\partial f}{\partial y} = 3f(x, y)$. [6]

THIS PAGE IS FOR SCRAP WORK.