

MATH2000 summer tutorial quiz 2

CREDIT WILL BE GIVEN ONLY FOR WORK WRITTEN ON THIS SCRIPT.

Use the back of pages if the space provided is insufficient, or for rough working.

The last page is blank and can be used for rough working.

You should attempt all three questions.

This quiz constitutes 9% of your final grade.

Calculators are not allowed.

This quiz is closed book – no additional materials are permitted

You have 30 minutes to complete the questions.

There is no perusal time.

Family name:

Given names:

Student number:

Signature:

EXAMINER'S USE ONLY

Q1	Q2	Q3	TOTAL
/3	/3	/3	/9

1. (3 marks)

Evaluate the line integral

$$\oint_C xy \, dx + x^2 \, dy,$$

where C consists of the line segments from $(0, 1)$ to $(0, 0)$ and from $(0, 0)$ to $(1, 0)$ and the parabola $y = 1 - x^2$ from $(1, 0)$ to $(0, 1)$.

2. (3 marks)

For the twice continuously differentiable vector function

$$\mathbf{v}(x, y, z) = v_1(x, y, z)\mathbf{i} + v_2(x, y, z)\mathbf{j} + v_3(x, y, z)\mathbf{k},$$

prove that $\operatorname{div}(\operatorname{curl}(\mathbf{v})) = 0$.

3. (3 marks)

Calculate the net outward flux of the vector field

$$\mathbf{F}(x, y, z) = x^2\mathbf{i} + xy\mathbf{j} + z\mathbf{k}$$

across the surface of the solid bounded by the paraboloid $z = 1 - x^2 - y^2$ and the x - y plane.