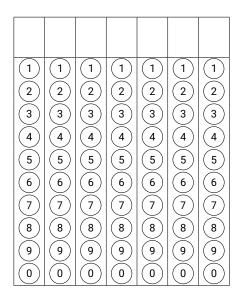
### **Questions**

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Surname, First name

Calculus 1A (Ca1A)

Calculus 1A - Sample Test 1 (EN) 9 November 2019 09:00 - 12:00



There are four types of questions: "final answer", "open answer", "multiple choice" and "multiple response".

### · Final answer

In the text frame below the question, you only provide \*one\* answer. Do not write down a calculation, explanation or motivation. If you do write down a calculation, explanation or motivation, it will not be taken into account for grading.

### · Open answer

You provide a calculation or motivation in the text frame below the question. The calculation or motivation will be graded. Any text outside the frame will be ignored.

### · Multiple choice

Only one answer is correct. Choose and mark the correct answer.

### Multiple response

More than one answer may be correct. Choose and mark the correct answer(s).



## **Exercise 1: Vectors**

Define the vectors  $\mathbf{u} = \langle -1, 2, 2 \rangle$  and  $\mathbf{v} = \langle 4, -3, 0 \rangle$ .

1p **1a** Calculate  $\mathbf{u} \times \mathbf{v}$ .

Provide the answer (and only the answer) in the frame below.

2p **1b** Calculate  $\cos \theta$ , where  $\theta$  is the angle between  ${\bf u}$  and  ${\bf v}$ .

Provide the answer (and only the answer) in the frame below.

2p **1c** Calculate the projection of  ${\bf u}$  onto  ${\bf v}$ .

Provide the answer (and only the answer) in the frame below.

# **Exercise 2: Equation of a Plane**

Define the points P(3,2,-1), Q(1,-1,2) and R(2,2,2).

3p **2** Calculate an equation of the plane through P, Q and R.

Provide the answer (and only the answer) in the frame below.



# **Exercise 3: Limits and continuity**

 $\mbox{3p} \quad \mbox{3a} \quad \mbox{Show that } \lim_{x \to 0} \frac{x}{\sqrt{x+1}-1} = 2.$ 

Give a full calculation/motivation in the frame below.

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2p **3b** For which value of p is the following function continuous for every  $x \in \mathbb{R}$ ?

$$f(x) = \begin{cases} 2x - p & \text{if } x \leq 0, \\ \frac{x}{\sqrt{x+1} - 1} & \text{if } x > 0. \end{cases}$$

Provide the answer (and only the answer) in the frame below.



## **Exercise 4: Extreme Values**

Define the function f as follows:

$$f(x) = x^3 - x^2 - x + 1.$$

2p **4a** Calculate the critical points of f.

Give a full calculation/motivation for your answer in the frame below.

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1p **4b** Determine the absolute extreme values of f(x) where  $x \in [-2, 2]$ .

This a multiple choice question; only one answer is correct.

- O Absolute minimum is -9, absolute maximum is 3.
- O Absolute minimum is -2, absolute maximum is 2.
- O Absolute minimum is -9, absolute maximum is  $\frac{32}{27}$ .
- O Absolute minimum is 0, absolute maximum is  $\frac{32}{27}$ .
- O Absolute minimum is  $\frac{32}{27}$ , absolute maximum is 3.
- O Absolute minimum is  $-\frac{1}{3}$ , absolute maximum doesn't exist.
- O Absolute minimum is  $-\frac{1}{3}$ , absolute maximum is  $\frac{32}{27}$ .
- O Absolute minimum is  $-\frac{32}{27}$ , absolute maximum is 3.

## **Exercise 5: Functions of Two Variables**

Define  $f(x,y)=\dfrac{x-y}{x^2+y^2}$  for all  $(x,y)\neq (0,0).$ 

3p **5a** Calculate  $\lim_{(x,y)\to(0,0)}f(x,y)$  if this limit exists, or prove that this limit does not exist.

Give a full calculation/motivation for your answer in the frame below.

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3p **5b** Define a=1 and b=-1. Let c=f(a,b). Calculate an equation for the tangent plane V to the graph of f at the point (a,b,c).

Give a full calculation/motivation for your answer in the frame below.

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