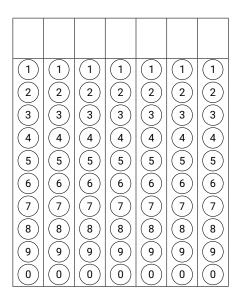
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Surname, First name

Calculus 1A (Ca1A)

Calculus 1A - Sample Test 2 (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 points P(-1,2,-2), Q(0,1,-2) and R(1,1,-1). Let $\mathbf{u}=\overrightarrow{PQ}$ and $\mathbf{v}=\overrightarrow{PR}$.

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

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

2p **1b** Calculate the angle θ between \mathbf{u} and \mathbf{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.

3p **1d** Calculate an equation of the the plane through P, Q and R.

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





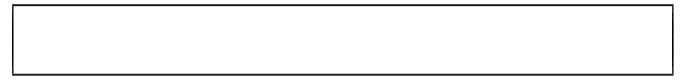
Exercise 2: Continuity

 $\mathbf{3p} \qquad \mathbf{2a} \quad \mathsf{Calculate} \lim_{x \to 1} \frac{e^{x^2-1}-1}{x-1}.$

Give a full calculation/motivation in the frame below.

 $\text{2p} \quad \text{ 2b} \quad \text{With } a \neq 1 \text{, calculate } \lim_{x \to 1} \frac{e^{x^2-1}-1}{x-a}.$

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



Exercise 3: Extreme Values

Define the function f as follows:

$$f(x) = \sqrt{x^3 + 3x^2}.$$

1p **3a** Show that f is not differentiable at 0.

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

1p **3b** Calculate all critical points x > -3 of f.

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

1p **3c** Determine the absolute extreme values of f(x) where $x \in [-1, 1]$.

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

- O Absolute minimum is 0, absolute maximum is $\sqrt{2}$.
- O Absolute minimum is 0, absolute maximum is 2.
- O Absolute minimum is -1, absolute maximum is 1.
- O Absolute minimum is $\sqrt{2}$, absolute maximum is 2.
- O Absolute minimum is -1, absolute maximum is $\sqrt{2}$.
- O Absolute minimum is -1, absolute maximum doesn't exist.
- O Absolute minimum is 1, absolute maximum is 2.
- O Neither absolute minimum nor absolute maximum exist.

Exercise 4: Functions of Two Variables; Limits

Define $f(x,y)=\dfrac{(x+y)^3}{x^2+y^2}$ for all $(x,y)\neq (0,0).$

3p **4** 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.

Exercise 5: Functions of Two Variables; Tangent plane

Define $f(x,y) = \sqrt{x-y}$ for all x > y.

3p Define a=5 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.

