Questions

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Surname, First name

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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 $\mathbf{u}$ onto $\mathbf{v}$.

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

3p **2a** Calculate $\lim_{x \to 1} \dfrac{e^{x^2-1} - 1}{x - 1}$.

Give a full calculation/motivation in the frame below.

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

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.

- ○ Absolute minimum is 0, absolute maximum is $\sqrt{2}$.
- ○ Absolute minimum is 0, absolute maximum is 2.
- ○ Absolute minimum is -1, absolute maximum is 1.
- ○ Absolute minimum is $\sqrt{2}$, absolute maximum is 2.
- ○ Absolute minimum is -1, absolute maximum is $\sqrt{2}$.
- ○ Absolute minimum is -1, absolute maximum doesn't exist.
- ○ Absolute minimum is 1, absolute maximum is 2.
- ○ 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 $\lim\limits_{(x,y)\to(0,0)} f(x,y)$ 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 **5** 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.