

TRENT UNIVERSITY, Fall 2024

MATH 1110H-A Midterm Test

Wednesday, 30 October

Time: 50 minutes

Name: _____

STUDENT NUMBER: _____

Question	Mark
1	_____
2	_____
3	_____
Total	_____ /30

Instructions

- *Show all your work.* Legibly, please! Simplify where you reasonably can.
- *If you have a question, ask it!*
- Use the back sides of all the pages for rough work or extra space.
- You may use a calculator and all sides of one letter- or A4-size aid sheet.
- If you do more than the minimum number of parts or questions, only the first ones the marker finds will be marked. Cross out anything you do not want marked.

1. Do any *two* (2) of parts **a-c**. [10 = 2 × 5 each]

a. Use the ε - δ definition of limits to check that $\lim_{x \rightarrow 1} (2x + 1) = 3$.

b. Determine whether $g(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$ is continuous at $x = 0$.

c. Compute $\lim_{x \rightarrow \infty} \frac{\sqrt{x+1} - \sqrt{x-1}}{\sqrt{x+1} + \sqrt{x-1}}$.

2. Find $\frac{dy}{dx}$ in any *two* (2) of parts **a-c**. [10 = 2 × 5 each]

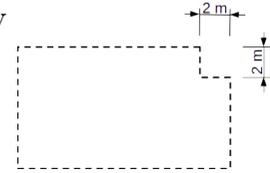
a. $y = \cos^2(x) - \sin^2(x)$ **b.** $y = \frac{x^2 + 1}{x^3}$

c. $y = 2x^2 + 3$ (Using the limit definition of the derivative in this part.)

3. Do *one* (1) of parts **a** or **b**. [10]

a. Find the domain as well as any – and all! – intercepts, horizontal and vertical asymptotes, intervals of increase and decrease, and local maximum and minimum points, of $f(x) = \frac{x^2}{x^2 + 1}$, and sketch its graph based on this information.

b. An almost rectangular plot is to be fenced off, using exactly 40 m of fencing. It's almost rectangular in that a 2×2 m square is to be left out of one corner of the rectangle, but still fenced, as in the diagram at right. What is the largest possible area of such a plot?



[Total = 30]