Trent University, Summer 2025

MATH 1110H Midterm Test

Monday, 7 July

Time: 60 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 $\lim\limits_{x \to 3}(4x - 5) = 7$.

    b. Compute $\lim\limits_{x \to -1} \dfrac{x^3 - x}{x + 1}$.

    c. Use the limit definition of the derivative to verify that $\dfrac{d}{dx} x^3 = 3x^2$.

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

a. $y = \ln\left(\sec(x)\right)$ **b.** $y = \dfrac{x+1}{x^3 - x}$ **c.** $e^{x^2 + y^2} = 10$

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, local maximum and minimum points, intervals of concavity, and inflection points of $f(x) = e^{-x^2}$, and sketch its graph based on this information.

    b. Two very long straight walls meet at right angles.
    i. A triangular plot is to be created by cutting off this corner with a straight fence from one wall to the other. What is the maximum possible area of the plot if the fence is 25 *m* long? *[7]*
    ii. A quarter-disk plot is to be created by cutting off this corner with a fence that is a circular arc centred at the corner. What is the area of this plot if this fence is 25 *m* long? *[3]*