

TRENT UNIVERSITY, Fall 2023

## MATH 1110H-B Test

Monday, 30 October

Time: 60 minutes

Name: \_\_\_\_\_

STUDENT NUMBER: \_\_\_\_\_

Question	Mark
1	_____
2	_____
3 or 4	_____
<b>Total</b>	_____ /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**. [ $10 = 2 \times 5$  each]
  - a. Use the  $\varepsilon$ - $\delta$  definition of limits to verify that  $\lim_{x \rightarrow 2} (2x - 5) = -1$ .
  - b. Compute  $\lim_{t \rightarrow 0} \frac{4t}{e^{2t} - 1}$ .
  - c. Use the limit definition of the derivative to find  $\frac{d}{dx} (x^2 - x + 4)$ .

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

**a.**  $e^{y+x} = e^x$       **b.**  $y = (\sqrt{x+1} - 1)(\sqrt{x+1} + 1)$       **c.**  $y = \sin\left(x + \frac{1}{x}\right)$

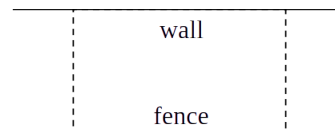
Do *one* (1) of questions **3** or **4**. [10]

**3.** Suppose  $y = a \cos(x) + b \sin(x)$  for some constants  $a$  and  $b$ .

*i.* Show that this function satisfies the differential equation  $\frac{d^2y}{dx^2} = -y$ . [6]

*ii.* Determine the constants  $a$  and  $b$  if it is known that  $y = 1$  when  $x = 0$  and also when  $x = \frac{\pi}{2}$ . [4]

**4.** A rectangular plot next to a wall is to be fenced off, using the wall as one side of the plot. What is the maximum area of such a plot, given that there are 40 m of fencing available?



[Total = 30]