Mathematics 1110H – Calculus I: Limits, Derivatives, and Integrals

TRENT UNIVERSITY, Fall 2018

MATH 1110H Test

Friday, 2 November

Time: 11:00–11:50

Space: SC 137

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) an aid sheet.

1. Compute $\dfrac{dy}{dx}$ for any *four* (4) of parts **a**–**f**. *[12 = 4 × 3 each]*

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

d. $y = \cos(2x)\sin(2x)$ **e.** $y = \sinh(x) + \cosh(x)$ **f.** $y = e^{\sqrt{x}}$

2. Do any *two* (2) of parts **a**–**e**. *[8 = 2 × 4 each]*

a. Compute $\displaystyle\lim_{t\to\infty} \frac{\sin(t)+\cos(t)}{t}$.

b. Find the maximum value of $f(x) = e^{-x^2}$ for $-2 \le x \le 2$.

c. Use the ε–δ definition of limits to verify that $\displaystyle\lim_{x\to -1}(3x+2) = -1$.

d. Find the equation of the tangent line to $y = \ln(x)$ at $x = 1$.

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

3. Find the domain and any and all intercepts, intervals of increase and decrease, maximum and minimum points, intervals of curvature, and inflection points of the function $h(x) = xe^{-x}$, and sketch its graph based on this information. *[10]*

[Total = 30]