

**Mathematics 110 – Calculus of one variable**  
TRENT UNIVERSITY, 2003-2004

**§A – Test #1**

Wednesday, 12 November, 2003

Time: 50 minutes

**Instructions**

- Show all your work.
- If you have a question, *ask!*
- You may use a calculator and either a two-sided 8.5" × 11" aid sheet or the pamphlet *Formula for Success*.

1. Find  $\frac{dy}{dx}$  in any *three* of **a-e**. [12 = 3 × 4 ea.]

a.  $y = x \ln\left(\frac{1}{x}\right)$       b.  $x^2 + 2xy + y^2 - x = 1$       c.  $y = \sin\left(e^{\sqrt{x}}\right)$   
d.  $y = \frac{2^x}{x+1}$       e.  $y = \cos(2t)$  where  $t = x^3 + 2x$

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

a. Determine whether  $g(x) = \begin{cases} \frac{x-1}{x^2-1} & x \neq 1 \\ \frac{1}{2} & x = 1 \end{cases}$  is continuous at  $x = 1$  or not.

b. Use the definition of the derivative to compute  $f'(1)$  for  $f(x) = \frac{1}{x}$ .

c. Find the equation of the tangent line to  $y = \sqrt{x}$  at  $x = 9$ .

3. Do *one* of **a** or **b**. [8]

a. Use the  $\varepsilon - \delta$  definition of limits to verify that  $\lim_{x \rightarrow 2} x^2 = 4$ .

b. Use the  $\varepsilon - N$  definition of limits to verify that  $\lim_{t \rightarrow \infty} \frac{1}{t+1} = 0$ .

4. Find the intercepts, the maximum, minimum, and inflection points, and the vertical and horizontal asymptotes of  $f(x) = xe^{-x^2}$  and sketch the graph of  $f(x)$  based on this information. [10]

[Total = 40]