Mathematics 1100Y – Calculus I: Calculus of one variable
Trent University, Summer 2011
MATH 1100Y Test #1
Wednesday, 8 June, 2011

Time: 50 minutes

Instructions
- *Show all your work.* Legibly, please!
- *If you have a question, ask it!*
- Use the back sides of the test sheets for rough work or extra space.
- You may use a calculator and an aid sheet.

1. Find $\frac{dy}{dx}$ in any *three* (3) of **a**–**d**. *[9 = 3 × 3 each]*

    a. $y = \left(x^2 + 1\right)^3$ **b.** $\ln(x + y) = 0$ **c.** $y = x^2 e^x$ **d.** $y = \dfrac{\tan(x)}{\sec(x)}$

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

    a. Use the $\varepsilon - \delta$ definition of limits to verify that $\lim\limits_{x \to 2}(x + 1) = 3$.

    b. Use the limit definition of the derivative to compute $f'(0)$ for $f(x) = x^3 + x$.

    c. Compute $\lim\limits_{x \to 3} \dfrac{x^2 - 9}{x - 3}$.

3. Do any *two* (2) of **a**–**c**. *[12 = 2 × 6 each]*

    a. Each side of a square is increasing at a rate of $3\,cm/s$. At what rate is the area of the square increasing at the instant that the sides are $6\,cm$ long?

    b. $f(x) = e^{-1/x^2} = e^{-(x^{-2})}$ has a removable discontinuity at $x = 0$. What should the value of $f(0)$ be to make the function continuous at $x = 0$?

    c. What is the smallest possible perimeter of a rectangle with area $36\,cm^2$?

4. Let $f(x) = \sqrt{x^2 + 1}$. Find any and all intercepts, vertical and horizontal asymptotes, and maxima and minima of $f(x)$, and sketch its graph using this information. *[9]*

[Total = 40]

Bonus. Simplify $\cos\left(\arcsin(x)\right)$ as much as you can. *[1]*