Simon Fraser University
Math 151-3, Spring 2004
Test 1

Time: 50 minutes **4 February 2004**

Last Name Given Names

Student Number

Instructions

- Do not open this test booklet until instructed to do so.
- Print your name and write your student number above.
- No calculators may be used. Any student found with a calculator will receive a mark of 0 immediately.
- Full marks will be awarded for correct, complete and well-organized solutions.
- You may use the back of any page for rough work.
- There are 7 pages in this test booklet.

Question	**Marks**
1	**/8**
2	**/4**
3	**/8**
4	**/4**
5	**/4**
6	**/2**
Total	**/30**

1. Find the following limits if they exist. Show and justify your work.

(a) [4 marks] $\lim_{y \to 1} \dfrac{y-1}{\sqrt{y+3}-2}$

(b) [4 marks] $\lim_{x \to 0} \dfrac{\sin x}{x + \tan x}$

2. [4 marks] Use the **definition of limits** to prove that

$$\lim_{x \to 2} (4x - 3) = 5.$$

Your proof should involve the variables δ and ϵ.

3. (a) [4 marks] Find $f'(x)$ if

$$f(x) = \frac{1}{x} - x^3 + e^2 - 1$$

(b) [4 marks] Compute the derivative of

$$g(t) = \sqrt{t}\ \cos\sqrt{t+1}$$

4. [4 marks] Find the maximum and minimum value of the function

$$f(x) = x^3 + 6x^2 - 15x + 4$$

on the interval $[0, 2]$.

5. [4 marks] Let k be a real number. Find **all** values of k such that the function

$$f(x) = \begin{cases} kx^2 + x - 1 & \text{if } x \leq 1 \\ \dfrac{1+x}{k} & \text{if } x > 1 \end{cases}$$

is continuous at $x = 1$. Justify your answer.

6. [2 marks] Let r be an arbitrary positive real number. Apply the intermediate value property of continuous functions to show that r has a square root. Show and justify your work.