

# Simon Fraser University

## Math 151-3, Summer 04 Midterm 1

Date: 2 June, 2004  
Time: 8:30 am - 9:20 am  
Place: C9002

Last Name\_\_\_\_\_ Given Names\_\_\_\_\_

Student Number\_\_\_\_\_

### Instructions

1. Do not open this test booklet until instructed to do so.
2. Print your name and write your student number above.
3. No calculators or other calculating devices may be used.
4. Full marks will be awarded for correct, complete and well-organized solutions.
5. You may use the back of any page for rough work.
6. There are 6 pages in this test booklet.

Question	1	2	3	4	5	6	Total
Marks	/10	/9	/4	/6	/10	/6	/45

Good Luck!

1. a) Find the limit  $\lim_{x \rightarrow 0} \frac{x}{4(\sqrt{x+1}-1)}$ . (4 marks)

b) Find all numbers  $c$  and  $d$  so that  $f$  defined by

$$f(x) = \begin{cases} \frac{\sin cx}{x}, & x < 0 \\ 4, & x = 0 \\ x + d^2, & x \geq 0 \end{cases}$$

will be continuous at  $x = 0$ . (6 marks)

2. Find  $y'$

a)  $y = \frac{2x^2 - \sqrt[3]{x}}{\sqrt{x}}$

(4 marks)

b)  $y = (1 + \sqrt{x^2 + 1})^{100}$

(5 marks)

3. Given  $f(x) = (x+1)(x+2)\cdots(x+100)$ , find  $f'(-1)$ . (4 marks)

4. Apply the intermediate value property of continuous functions to show that the equation  $x^3 - 3x^2 + 1 = 0$  has a solution on  $[0,1]$ . (6 marks)

5. a) Find the equation of the tangent to the curve  $y = x^2$  that is perpendicular to the line  $y = \frac{1}{2}x + 1$ . (6 marks)

- b) The area of a circle is decreasing at the rate of  $2\pi \text{ cm}^2 / \text{s}$ . At what rate is the radius of the circle decreasing when its area is  $25\pi \text{ cm}^2$ ? (4 marks)

6. A rectangle has a perimeter of  $200\text{ cm}$ . What length and width should it have so that its area is a maximum? (6 marks)