

Simon Fraser University

MATH 154-1, Spring 2005

Midterm 1

February 9, 2005, 8:30 – 9:20 am

Last Name (please print): _____

First Name (please print): _____

Student Number: _____

Instructions:

1. DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.
2. Fill in the above box.
3. This exam contains 6 pages with a total of 8 questions. Once the exam begins please check to make sure your exam is complete.
4. SHOW ALL YOUR WORK!
5. If you run out of space in a problem, use the space on the back of the previous page and clearly indicate where the solution continues.
6. **Only** scientific calculators are allowed.
7. No book, paper, or device, other than the usual writing instruments, this booklet and a scientific calculator, shall be within reach of a student during the examination.
8. During the examination, speaking to, communicating with, or deliberately exposing written papers to the view of other examinees is forbidden.

Question	Marks
1	/5
2	/3
3	/8
4	/4
5	/4
6	/8
7	/4
8	/4
Total	/40

1 Answer **T** (true) or **F** (false) in the boxes provided or leave the box blank. No explanation is necessary. Every correct answer will receive **1**. **[5 marks]**

a) ☐ If f is continuous at $x = c$, then both $\lim_{x \rightarrow c^-} f(x)$ and $\lim_{x \rightarrow c^+} f(x)$ exist and are equal.

b) ☐ If $x > 0, y > 0$, then $\ln \frac{x}{y} = \frac{\ln x}{\ln y}$.

c) ☐ The horizontal line test can be used to decide whether or not $y = f(x)$ is a function.

d) ☐ $y = e^x + x^e$ is continuous everywhere.

e) ☐ If the size of a population at time t is given by $N(t) = \frac{100}{1 + e^{-t}}$, for $t \geq 0$, then the size of the population will approach 50 as $t \rightarrow \infty$.

2 For the one-to-one function $y = f(x) = 3x + 2$, find its inverse function.

[3 marks]

3 [4 marks each]

a) Suppose that $f(x) = \ln x$, $g(x) = \sqrt{x^2 - 1}$, find the domains of $f(x)$, $g(x)$ and $(f \circ g)(x)$.

b) Solve for x , $\ln(x - 2) + \ln(x + 3) = \ln 2 + \ln 3$.

4 If the graph of a function $y = f(x)$ on a double-log plot is a straight line passing through $(0,1)$ and $(1,0)$, find the function $y = f(x)$. **[4 marks]**

5 A particular radioactive substance has a half-life of 100 days. If a given sample has a mass of 50 micrograms, find a formula for the mass after t days. **[4 marks]**

6 Find the following limits if they exist.

[4 marks each]

a) $\lim_{x \rightarrow 2} \frac{2-x}{|x-2|}$

b) $\lim_{x \rightarrow +\infty} (\sqrt{x^2 + x} - x)$

7 Determine all numbers a such that $f(x) = \begin{cases} \frac{a \sin 4x}{x}, & x \neq 0 \\ a^2, & x = 0 \end{cases}$ is continuous.

[4 marks]

8 Use the intermediate value theorem to show that $2x^7 - 5x^2 + 4 = 0$ has a solution in a number $(-1,1)$.

[4 marks]