

SIMON FRASER UNIVERSITY
DEPARTMENT OF MATHEMATICS AND STATISTICS

Midterm 1

MATH 150 Fall 2006

Instructor: Dr. Mulholland

October 4, 2006, 8:30 – 9:20 a.m.

Name: _____ (please print)
family name *given name*

SFU ID: _____
student number *SFU-email*

Signature: _____

Instructions:

1. Do not open this booklet until told to do so.
2. Write your name above in block letters. Write your SFU student number and email ID on the line provided for it.
3. Write your answer in the space provided below the question . If additional space is needed then use the back of the previous page. Your final answer should be simplified as far as is reasonable.
4. Make the method you are using clear in every case unless it is explicitly stated that no explanation is needed.
5. This exam has 5 questions on 8 pages (not including this cover page). Once the exam begins please check to make sure your exam is complete.
6. **No** calculators, books, papers, or electronic devices shall be within the reach of a student during the examination.
7. **During the examination, communicating with, or deliberately exposing written papers to the view of, other examinees is forbidden.**

Question	Maximum	Score
1	12	
2	8	
3	8	
4	6	
5	6	
Total	40	

1. Compute the following limits.

[3] (a) $\lim_{x \rightarrow -1} (x^3 - 2x^2 + 5x + 1)^2$

[3] (b) $\lim_{x \rightarrow 5} \frac{\sqrt{x-1} - 2}{x-5}$

[3] (c) $\lim_{x \rightarrow 7^-} \frac{x+1}{x-7}$

[3] (d) $\lim_{\theta \rightarrow 0} \frac{1 + \theta^2 - \cos^2 \theta}{\theta^2}$

2. True or False. If True provide an explanation, if False give justification (for instance give an example for which the statement doesn't hold).

[2] (a) If f is one-to-one, then $f^{-1}(x) = \frac{1}{f(x)}$.

[2] (b) The function $g(x) = x \sin(x)$ is an even function.

[2] (c) Suppose that a continuous function $f(x)$ satisfies the following table of values.

x	-1	-0.5	0	0.5	1	1.5	2	2.5	3
$f(x)$	-3	-1.25	0.25	0.75	1	0.75	-0.25	-1.25	-3

Then the function $f(x)$ has at least 2 zeros in the interval $(-1, 3)$.

[2] (d) If f has domain $[0, \infty)$ and has no horizontal asymptote, then $\lim_{x \rightarrow \infty} f(x) = \infty$ or $\lim_{x \rightarrow \infty} f(x) = -\infty$.

[2] **3.** (a) State the definition of **continuity** for a function $f(x)$ at $x = a$.

[3] (b) Suppose that

$$g(x) = \begin{cases} x^2 - 1 & \text{if } x \leq 0, \\ bx^3 - 2 & \text{if } 0 < x \leq 1, \\ 2x - b & \text{if } x > 1, \end{cases}$$

where b is some constant.

Is the function g continuous at $x = 0$? Justify your answer.

- [3] (c) Determine the constant b which makes the above function g continuous at $x = 1$.

[2] 4. (a) State the **Squeeze Law**, clearly identifying any hypotheses and the conclusion.

[4] (b) Use the Squeeze Law to compute $\lim_{x \rightarrow 0^+} \sqrt{x} e^{\sin(\pi/x)}$. Justify your answer.

[4] 5. (a) Find

$$\lim_{h \rightarrow 0} \frac{f(2+h) - f(2)}{h}$$

where $f(x) = x^3 - 1$.

- [1] (b) What does the result in (a) tell you about the tangent line to the graph of $y = f(x)$ at $x = 2$?

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- [1] (c) Find the equation of the tangent line to $y = f(x)$ at $x = 2$.