

Simon Fraser University
Department of Mathematics
Burnaby Campus

MATH 151-3, Fall 2004
Midterm 1 – Version 1
October 6th, 2004, 8:30 – 9:20 am

Full Name (please print): _____

Student Number: _____

Signature: _____

Instructor (please circle): P. Menz J. Yin

Instructions:

1. DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.
2. Fill in the above box.
3. This exam contains 7 pages with a total of 8 questions. Once the exam begins please check to make sure your exam is complete.
4. 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.
5. **Only** scientific calculators are allowed.
6. 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.
7. During the examination, speaking to, communicating with, or deliberately exposing written papers to the view of other examinees is forbidden.
8. Try your Best!

Do not write in this table!	
Question	Marks
1	/3
2	/3
3	/9
4	/4
5	/4
6	/9
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 $\frac{1}{2}$. **[3 marks]**

a) If $\lim_{x \rightarrow a} f(x) = f(a)$ then f is differentiable at $x = a$.

☐

b) As $x \rightarrow 0$ the limit of $\sin \frac{\pi}{x}$ does not exist.

☐

c) A polynomial function is continuous for all real numbers.

☐

d) The function $f(x) = |x|$ is differentiable for all real numbers.

☐

e) If $f'(x) > 0$ then f is decreasing.

☐

f) If f has a horizontal tangent at $x = a$ then $f'(a) = 0$.

☐

2. State the Squeeze Theorem. **[3 marks]**

3. Find the following limits if they exist. Show your work
[3 marks each = 9 marks]



a) $\lim_{x \rightarrow -3^-} \frac{x+3}{|x+3|}$

b) $\lim_{x \rightarrow 3^+} \frac{9-x^2}{x-3}$

c) $\lim_{x \rightarrow 0} \frac{1+x^2-\cos^2 x}{x^2}$

4. Let $f(x) = \begin{cases} ax^2, & \text{if } x \geq 2 \\ 3x + a, & \text{if } x < 2 \end{cases}$.



- a) For what value(s) of a is f continuous at $x = 2$? Show your work.
[3 marks]

- b) Is f differentiable at $x = 2$? Provide a reason. **[1 mark]**



5. Use the **definition of the derivative** for the following question.



a) State the definition of the derivative. **[1 mark]**

b) Use the definition of the derivative to find the derivative of $f(x) = \sqrt{x+3}$.
[3 marks]

6. Find $\frac{dy}{dx}$ if [3 marks each = 9 marks]

a) $y = \sqrt{(x-3)^2}$



b) $y = x \sec(3x)$



c) $y = \frac{e^{3x}}{\cos x}$

7. Find the tangent line(s) to the function $y = x^2 + 4$ that pass through the point $(0, 0)$. Write the tangent line(s) in the form $y = mx + b$. **[4 marks]**



8. Find the maximum and minimum values of $f(x) = 2x^3 + 3x^2 - 12x + 4$ on the interval $[0, 2]$. **[4 marks]**