Calculus I   Russell Brown
Exam 1   21 September 1999

Answer all of the following questions. Use the answer sheets provided.
Additional sheets are available if necessary. No books or notes may be used.
You may use a calculator. When answering these questions, please be sure
to 1) check answers when possible, 2) clearly indicate your answer and the
reasoning used to arrive at that answer *(unsupported answers may receive
NO credit)*, and 3) label all variables and equations.
Note that the point total on this exam is greater than 100 points, however
no student will be given a grade of greater than 100.

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Section ⎯⎯⎯⎯⎯⎯⎯

Question	Score	Total
1		10
2		10
3		40
4		15
5		10
6		5
7		10
Total		100

1. Below is the graph of a function $f(x)$.

   (a) Describe how you must shift the graph of f to find the graph of
       $g(x) = 2 + f(x+1)$.

   (b) On the axes below, sketch the graph of g.

   (c) Find $g(2)$.

2. For the function f, whose graph appears below, find the following, if they exist.

   (a) $\lim\limits_{x \to 1^+} f(x)$

   (b) $\lim\limits_{x \to 1^-} f(x)$

   (c) $\lim\limits_{x \to 1} f(x)$

   (d) $f(1)$

   (e) $\lim\limits_{x \to 2^+} f(x)$

   (f) $\lim\limits_{x \to 2^-} f(x)$

   (g) $\lim\limits_{x \to 2} f(x)$

   (h) $f(2)$

3. Use the limit laws to find the following limits, if they exist, or determine if the limit is $+\infty$ or $-\infty$. Credit will not be given for estimating with your calculator.

(a) $\lim\limits_{x \to 2} \dfrac{x^2 - 4}{x - 2}$

(b) $\lim\limits_{x \to 2} \dfrac{x^2 + 4}{x + 2}$

(c) $\lim\limits_{x \to 0^-} \dfrac{x}{|x|}$

(d) $\lim\limits_{x \to a} x^3 - 3x$

(e) $\lim\limits_{x \to \infty} \dfrac{2x^2 + 3x}{3x^2 + 2x}$

(f) $\displaystyle\lim_{x\to\infty} \sqrt{x+1} - \sqrt{x+2}$

(g) $\displaystyle\lim_{x\to 1^+} \frac{x}{x-1}$

(h) $\displaystyle\lim_{t\to 0} \frac{\tan t}{t}$

(i) $\displaystyle\lim_{t\to 0} \sin t \tan t$

(j) $\displaystyle\lim_{t\to 0} \frac{\sin t \cos t}{\sin 2t}$

4. (a) State the definition of $\lim_{x \to a} f(x) = L$.

   (b) Prove that
   $$\lim_{x \to 2} x^2 + 2x = 8$$

5. (a) Give the definition of an even function and give the definition of an odd function.

   (b) Suppose that $f(x)$ is an even function. What can you say about $xf(x)$? Is it always odd or always even? Why?

6. Give the definition of continuity at a point.

7. Find a so that the function

$$f(x) = \begin{cases} x^2 & x \geq 2 \\ ax & x < 2 \end{cases}$$

is continuous.