Calculus I *Spring 2003*
MA113:10-12 *Russell Brown*

Review for test 1 Below are a selection of problems to help prepare you for exam 1. In addition to these problems, you should understand all of the (non-starred) homework problems.

- Describe how to transform the graph of $f(x) = x^2$ into the graph of $g(x) = x^2 + 2x + 2$.
- If f and g are odd functions, determine if the following functions are odd or even: $f \circ g$, $f + g$ and fg.
- If $f(x)$ is even and $f(x) = x^3$ for $x \leq 0$, sketch the graph of f.
- Find the limits, or explain why they do not exist.
  1. $\lim_{x \to 2} \dfrac{x^2 - 2}{x^2 + 2}$
  2. $\lim_{x \to 2} \dfrac{x^2 + 4}{x^2 - 4}$
  3. $\lim_{x \to 2} \dfrac{x^2 - 4x + 4}{x^2 - 4}$
  4. $\lim_{x \to 2} \dfrac{x^2 + 2}{(x - 2)^2}$
  5. $\lim_{x \to 2} \dfrac{|x|}{x}$
  6. $\lim_{x \to 0^+} \dfrac{|x|}{x}$
  7. $\lim_{x \to 0} \dfrac{|x|}{x}$
- State the squeeze theorem.
- Use the squeeze theorem to find the limit:
$$\lim_{x \to 0} x^4 \cos(1/x^2).$$
- State the definition of continuity.
- Find c so that
$$f(x) = \begin{cases} x + 1 & x > c \\ x^2 & x \leq c \end{cases}$$
is continuous everywhere.
- State the intermediate value theorem.
- Use the the intermediate value theorem to show $f(x) = x^3 + \sqrt{1 + x^2}$ has a root.
- State the definition of derivative.

- Be able to compute the derivatives of

$$x^2 + 2x, \quad \frac{1}{(x+1)^2}, \quad \sqrt{x}, \quad x^3$$

  using the definition.

- Find the tangent line(s) to $y = x^2$ which pass through $(-3, 0)$

- Be able to prove the product rule, the quotient rule and the reciprocal rule for differentiation.