

# Math 2215 - Calculus 1

Homework #2 - 2005.08.31

Due Date - 2005.09.09

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1. Compute the following limit:

$$\lim_{x \rightarrow a} \frac{x^3 - a^3}{x^4 - a^4}$$

2. Compute the following limit:

$$\lim_{h \rightarrow 0} \frac{\frac{1}{2+h} - \frac{1}{2}}{h}$$

3. Use the Squeeze Theorem to prove the following:

$$\lim_{x \rightarrow 0} \frac{x^2}{1 + (1 + x^4)^{\frac{5}{2}}} = 0$$

*Hint: Notice that the function in question is always positive. What function can you bound it from above?*

4. Show that the function  $p(x) = x \cos(\pi x) + x^2 - 1$  has at least one positive root and one negative root.

5. What value should be assigned to  $a$  to make the function

$$g(x) = \begin{cases} x^2 - 1, & x < 3 \\ 2ax, & x \geq 3, \end{cases}$$

continuous at  $x = 3$ ?

6. Compute the following limit:

$$\lim_{x \rightarrow \infty} \frac{x\sqrt{4x^4 + 3x}}{12x^3 + 23x^2 - 16x + 4}$$

7. Let  $f(x) = \frac{x-1}{x}$ . Show that  $f(x) \cdot f(1-x) = 1$ .