MATH 12002   **HOMEWORK #2 (12 pts)**   **SPRING 2009**
SHOW ALL WORK FOR FULL CREDIT — PLEASE CIRCLE YOUR FINAL ANSWER

DUE: TUESDAY, FEBRUARY 3, 2009 AT THE BEGINNING OF CLASS

1. (1 pt each) Determine if the following functions are continuous or discontinuous at a. If it is discontinuous, explain which of the three conditions on page 46 is violated. If it is continuous, show why.

   (a) $f(x) = \begin{cases} \dfrac{x^3 - 2x^2}{x - 2} & \text{if } x < 2 \\ 3x^2 - 8 & \text{if } x \geq 2 \end{cases}$ $a = 2$

   (b) $g(x) = \begin{cases} x^2 - 3, & \text{if } x \neq 5 \\ 21, & \text{if } x = 5 \end{cases}$ $a = 5$

2. (2 pts each) Locate all the discontinuities of the function.

   (a) $f(x) = \dfrac{x + 1}{1 + 2 \sin 4x}$

   (b) $f(x) = \dfrac{4}{2 \sin^2 x - \cos x - 1}$

3. (2 pts) Find the numbers at which f is discontinuous. At which of these points is f continuous from the right, continuous from the left, or neither. Show all work.

$$f(x) = \begin{cases} x + 1 & \text{if } x \leq 1 \\ \dfrac{8}{x + 3} & \text{if } 1 < x < 3 \\ \sqrt{x - 3} & \text{if } x \geq 3 \end{cases}$$

4. (1 pt) Use the Intermediate Value Theorem to show that there is a solution of the equation

$$2x^5 + 3x^2 - 9x = 7x^3 - 1$$

5. (1 pt each) Find each limit:

(a) $\displaystyle\lim_{x \to 6^-} \frac{3}{x - 6}$

(b) $\displaystyle\lim_{x \to -\infty} \frac{x + 2}{\sqrt{9x^2 + 1}}$

(c) $\displaystyle\lim_{x \to \infty} \left(\sqrt{x^2 + 3x} - \sqrt{x^2 + 7x} \right)$