$\begin{array}{ll} \star \mbox{ Answer and mark clearly the questions in the provided answer sheets.} \\ \mbox{ Write down your name and student's ID on the each answer sheet you used.} \\ \star \mbox{ Note: No points will be given if no arguments are provided for an answer.} \\ \mbox{ Good Luck!} & \sim \sim Yuling \\ \end{array}$ 

1. (40 points) Find the indicated limit or show it does not exist. If the limiting value is infinite, indicate whether it is  $\infty$  or  $-\infty$ .

$$\lim_{x \to 1-} \frac{x - \sqrt{x}}{x - 1}, \qquad \lim_{x \to 9} \frac{\sqrt{x} - 3}{x - 9}, \qquad \lim_{x \to +\infty} \frac{x^2 + x - 5}{1 - 2x - x^3}, \qquad \lim_{x \to 0+} \sqrt{x \left(1 + \frac{1}{x^2}\right)}$$

- 2. List all the values of x for which the given function is not continuous
  - (a) (10 points)  $f(x) = 5x^3 3x + \sqrt{x}$
  - (b) (10 points)  $f(x) = \frac{x^2 2x + 1}{x^2 x 2}$
- 3. (10 points) Find the value of the constant A so that the function f(x) will be continuous for all x, where

$$f(x) = \begin{cases} \frac{x^2 - 1}{x + 1} & \text{if } x < -1, \\ Ax^2 + x - 3 & \text{if } x \ge -1. \end{cases}$$

- 4. (10 points) Show that the equation  $\sqrt[3]{x} = x^2 + 2x 1$  must have at least one solution on the interval  $0 \le x \le 1$ .
- 5. (20 points) Compute (by definition) the derivative of  $f(x) = 2 3x^2$  and find the equation of its tangent line at x = c, where c = 1.