⋆ Answer and mark clearly the questions in the provided answer sheets.
Write down your name and student's ID on the each answer sheet you used.
∗ **Note:** No points will be given if no arguments are provided for an answer.
Good Luck! $\sim\sim$ *Yuling* $\ddot{\smile}$

1. (10 points) Find the domain and range of the function $f(x) = \sqrt{1-x}$.

2. (50 points) Find the indicated limit, if it exists. If the limiting value is infinite, indicate whether it is ∞ or $-\infty$.

$$(a)\ \lim_{x\to 0}\frac{x^2-x}{2x} \quad (b)\ \lim_{x\to 1}\frac{\sqrt{x}-1}{x-1} \quad (c)\ \lim_{x\to 1}\frac{2x-2}{x^3+x^2-2x}$$

$$(d)\ \lim_{x\to\infty}\frac{x^5-x^3+x-1}{x^6+2x^2+1} \quad (e)\ \lim_{x\to 0^+}\frac{1}{x}$$

3. (10 points) Determine all values of x at which the function f is discontinuous, where

$$f(x) = \frac{x^2-2x}{x^2-3x+2}.$$

4. (10 points) Let

$$f(x) = \begin{cases} x+2 & \text{if } x \le 1 \\ kx^2 & \text{if } x > 1 \end{cases}$$

Find the constants k that will make f continuous on $(-\infty, \infty)$.

5. (10 points) Show that the function $f(x) = x^3 - 2x^2 + 3x + 2$ is continuous on the interval $[-1, 1]$, hence f must have at least one zero in the interval $(-1, 1)$.

6. (10 points) Let $f(x) = 2x^2 + 1$. Find the derivative f' of f, then find an equation of the tangent line to the curve at the point $(1, 3)$.