1. Let $f : \mathbb{R} \to \mathbb{R}$ be a function defined on $\mathbb{R}$. Please use the $\epsilon - \delta$ language to define what it means for the function $f(x)$ to be continuous at $x = 1$. (10%)

2. Please use the $\epsilon - \delta$ language to prove that $\lim_{x \to 1} \frac{1}{x} = 1$.(10%)

3. Let $a_1, a_2, a_3, \cdots$ be a sequence of positive numbers. Please give a definition for what the following limit means:
$$\lim_{n \to \infty} a_n = 2015.$$
(10%)

4. Let $f_n(x) : [0,1] \to \mathbb{R}$, $n = 0, 1, 2, \cdots$, be a sequence of functions. Please give a definition for what it means for $\{f_n(x)\}_{n \geq 1}$ to be uniformly convergent to $f_0(x)$.(10%)

5. Let $f : \mathbb{R} \to \mathbb{R}$ be a function defined on $\mathbb{R}$. Please give a definition for $f(x)$ to be uniformly continuous.(10%)

6. Please find the antiderivative: $\int \ln(x)dx =$ 　　(10%)

7. Please find the limit: $\lim_{x \to 0^+} x^x =$ 　　(10%)

8. If $f : \mathbb{R} \to \mathbb{R}$ is continuous, then show that
$$\int_0^x [\int_0^u f(t)dt]du = \int_0^x f(u)(x - u)du.$$
(10%)

9. Give an example of a function $f : [0,1] \to \mathbb{R}$ such that f is not Riemann integrable. Please justify your answer.(20%)