※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Determine the limit of the following sequence and give an $\varepsilon - N$ (definition) proof of convergence.

$$a_n = 1/\sqrt{2n+5}.$$

(20 points)

2. Let f be continuous on $\mathbb{R}$ and that $\lim_{x \to \pm\infty} f(x) = 0$. Show that f will attain either a maximum on $\mathbb{R}$ or a minimum on $\mathbb{R}$ or both.　(20 points)

3. Let f be differentiable on $\mathbf{R}$ and that $f'(x) \geq c > 0$ for all x. Show that for each $y \in \mathbf{R}$, there is an unique x such that $f(x) = y$.　(20 points)

4. Define a function g by

$$g(x) = \begin{cases} 1, & x = 1/n,\ n \in \mathbf{N} \\ 0, & \text{otherwise.} \end{cases}$$

Show that $\int_0^1 g = 0$.　(20 points)

5. Evaluate the double integral $\int_0^2 \int_y^2 e^{x^2} dx dy$.　(20 points)