大同大學 九十七 學年度研究所碩士班入學考試試題

考試科目:工程數學　　所別: 通訊工程研究所　　

註:本次考試不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

1. **[15 points]** Evaluate the determinant of $\begin{bmatrix} 1 & 3 & 9 \\ 1 & 13 & 169 \\ 1 & 23 & 529 \end{bmatrix}$.

2. **[20 points]** Find the limit of A^k as $k \to \infty$ if $A = \begin{bmatrix} 1/2 & 3 & 4 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.

3. **[20 points]** A graduate school gives a test to select the best 30 from among 100 applicants. The mean grade on this test turns out to be 60, and the scores have a standard deviation 7. Assume that the distribution is symmetric about the mean. Can an applicant who has a 69 score count on being selected? Why or why not?

4. **[15 points]** Suppose that the response time of a web server has an exponential distribution with a mean of 35 milliseconds. What is the probability that response time exceeds 70 milliseconds?

5. **[15 points]** Find the Fourier transform of the function $f(t) = e^{-t^2+6t}$.

6. **[15 points]** Prove that $\int_{-\infty}^{\infty} \left(\frac{\sin(\pi x)}{\pi x} \right)^2 dx = 1$.