淡江大學九十四學年度碩士班招生考試試題 101-1

系別：資訊工程學系　　科目：數　學(含離散數學、線性代數)

准帶項目請打「V」
簡單型計算機

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15% 1. Given the function $f(x)=2x+1$ and $g(x)=x^2-2$ respectively.

Please find (*a*) the composition function $g\circ f$. (*b*) $(g\circ f)(7)$.

15% 2. (*a*) Draw the multigraph **G** whose adjacency matrix $A=\begin{bmatrix}1&3&0&0\\3&0&1&1\\0&1&2&2\\0&1&2&0\end{bmatrix}$

(*b*) Please find the connection matrix of **G**. (*c*) Is **G** connected? Why?

15% 3. A man is at the origin on the x-axis and takes a unit step either to the left or to the right. He stops after **5** steps or if he reaches **3** or **–2**.

(a) Please draw the tree diagram of his travel paths.

(b) Find the number of paths the man can travel.

15% 4. Let **S** be the set of real numbers of the form $a+b\sqrt{3}$, where a and b are rational numbers. Please show that **S** is a field.

20% 5. (a) Please use Gram-Schmidt process to normalize $R^3:(0\ 1\ 1)^T,(1\ 0\ 1)^T,(1\ 1\ 0)^T$

(b) Using the result of (a), please find a normalized **QR**-decomposition for

matrix $A=\begin{bmatrix}0&1&1\\1&0&1\\1&1&0\end{bmatrix}$.

15% 6. Given that $y=a+bx+cx^2$ with observed data

x	-1	0	0	1
y	0	-2	-1	0

Please find a, b, c to minimize the sum of squared errors (i.e., to minimize $\sum_{i=1}^{4}[y_i-(a+bx_i+cx_i^2)]^2$).