| Sets and Logic | **Class-C** | Prof. JLF King |
| MHF3202 4628 | | 07Feb2008 |

C1: Show no work.   Please write **DNE** in a blank <u>if</u> the described object does not exist or if the indicated operation cannot be performed.
  Use $\mathcal{V}()$ for the ***Vince invariant*** of a cell in a TicTacToe board. Use ⊤⊤⊤ to abbreviate "TicTacToe".

a The author of our text is Circle :   **Archimedes**
Cantor   **DNE**   **Euler**   **Devlin**   **Machen**

b   In *Qubic*, $\mathcal{V}(\texttt{Center cell})=$ _____ .   And $\mathcal{V}(\texttt{Edge cell})=$ _____ .   There are _____ many cells whose Vince-invariant equals $\mathcal{V}(\texttt{Edge cell})$.

c The 7×7 ⊤⊤⊤ board has _____ many TicTacToes. And 4×4×4 (*Qubic*) has _____ many TicTacToes.

d An explicit bijection $F{:}\mathbb{N}\hookrightarrow\!\!\!\to\mathbb{Z}$ is this:
When n is *even*, then $F(n) :=$ _____ .
When n is *odd*, then $F(n) :=$ _____ .

e An explicit bijection $g{:}\left(-\frac{\pi}{2},\frac{\pi}{2}\right)\hookrightarrow\!\!\!\to\mathbb{R}$ is
$g(x) :=$ _____ .

f LBolt: $\mathrm{Gcd}(70,42)=$ _____ $\cdot\,70 +$ _____ $\cdot\,42$.
So (LBolt again) $G := \mathrm{Gcd}(70,42,60)=$ _____ and
_____ $\cdot\,70 +$ _____ $\cdot\,42 +$ _____ $\cdot\,60 = G$.

Essay questions: For each question, carefully write a triple–spaced, grammatical, essay solving the problem.

C2: Give an explicit bijection $f{:}C\to H$ between intervals $C := (0,4]$ and $H := (0,4)$.

C3: **α** *The **powerset** $\mathcal{P}(\Omega)$ of set Ω, is.* . . .

β   Give a complete proof that there is **no** surjection $h{:}\Omega\to\!\!\!\to\mathcal{P}(\Omega)$. In particular, given a map $h{:}\Omega\to\!\!\!\to\mathcal{P}(\Omega)$, explicitly construct a set $S_h \subset \Omega$ which is *guaranteed* to **not** be in the range of h.

γ When $\Omega := \{M,L,C\}$, the three Stooges, consider this map

$$g(M) := \{M,L,C\}\,;$$
$$g(L) := \{M,C\}\,;$$
$$g(C) := \{\}\,.$$

Your $S_g=\{$ _____ $\}$.

| End of Class-C |

C1:	___ ___ ___	150pts
C2:	___ ___	65pts
C3:	___ ___	80pts
Total:	___ ___ ___	295pts

Print name _____

Ord: _____