

高雄大學應用數學系  
每月挑戰 022-023

2013 年 6 月

1. 每個月將公布若干個數學問題徵答，由系上老師出題，歡迎同學來挑戰。
2. 同學解出任何一題皆可將解答投稿到系辦（答案紙格式可於系網頁上下載）。系上將擇優公布優良解答，並公開表揚優秀解題同學。

022

Show that, for any  $m, n \in \mathbb{N} \cup \{0\}$ ,

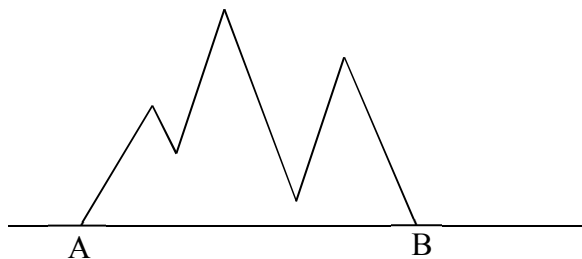
$$\frac{1}{2\pi} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} (x + iy)^m (x + iz)^n e^{-\frac{1}{2}(x^2+y^2+z^2)} dx dy dz = \sqrt{2\pi} \delta_{m,n} \cdot n!,$$

where  $i = \sqrt{-1}$  and  $\delta_{m,n} = 0$  as  $m \neq n$ ; 1 as  $m = n$ .

[施信宏 教授出題]

023

A mountain range is a polygonal curve from  $(a, 0)$  to  $(b, 0)$  (see figure 1 for an example) in the upper half-plane. Hikers A and B begin at  $(a, 0)$  and  $(b, 0)$ , respectively. Prove that A and B can meet by traveling on the mountain range in such a way that **at all times their heights above the horizontal axis are the same.**



[張惠蘭教授出題]