銘傳學刊
第十卷 第三期 民國八十八年七月
頁 295 － 頁 298

Journal of Ming Chuan University
Vol. 10, No. 3, July 1999
pp. 295-298

N維球體的一個奇妙性質

On a Curious Property of N-dimensional Sphere

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(Received March 27, 1999; Revised September 19, 1999; Accepted October 7, 1999)

摘要：在N維球體與其邊界之間有一個奇妙的性質。首先，觀察有趣的現象，圓盤的面積對於半徑的導數等於其圓週長，類似地，球的體積對於半徑的導數等於其表面積，最後，證明奇妙的性質，N維球體體積對於半徑的導數等於其N維球面積。

關鍵詞：圓盤、圓週長、球體體積、球面積、面積分、三角代換法

Abstract: There is a curious property between n-dimensional sphere and its boundary. It is interesting that the derivative of the disk area with respective to radius is equal to its circumference. Similarly, the derivative of the spherical volume with respective to radius is equal to its spherical area. At last, it is proved that the derivative of the n-dimensional spherical volume with respective radius is equal to its n-dimensional spherical area.

Key words: disk, circumference, spherical volume, spherical area, surface integral, trigonometric substitution

1. INTRODUCTION

This article will show a curious property between n-dimensional sphere and its boundary. The n-dimensional sphere S_n $(n>1)$ with radius r is defined to be the set $S_n = \{(x_1,...,x_n) | {x_1}^2 + ... + {x_n}^2 \le r^2 \}$. Therefore the boundary ∂S_n of S_n should be the set