

# 國立中山大學 101 學年度轉學生招生考試試題

科目：微積分【海科學程二年級】

題號：704/

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請標示題號並詳細回答下列問題。

1. (a) Find the derivative of  $f(x) = 5^x$  at  $x = 0$ . (10%)

(b) Find the point on the line  $y = x + 1$  that is closest to the point  $(4, 1)$ . (10%)

2. (a) Evaluate  $\int_0^{\sqrt{3}} x \tan^{-1} x dx$ . (10%)

(b) Evaluate the integral  $\int_0^2 \frac{x^2}{\sqrt{4-x^2}} dx$ . (10%)

3. (a) Find the values of  $x$  for which the series  $\sum_{n=1}^{\infty} (x-1)^n$  converges. (10%)

(b) Find the 3rd-degree Taylor polynomial of  $f(x) = x \cos x$  at  $x = 0$ . (10%)

4. (a) Find the directional derivative of  $f(x, y) = x^2 - 2xy$  at  $(2, 1)$  in the direction of  $\mathbf{v} = (3, 4)$ . (10%)

(b) Find the shortest distance from the point  $(3, 0, -2)$  to the plane  $x + y - z = 2$ . (10%)

5. (a) Evaluate (10%)

$$\int_0^3 \int_0^{2y} y^2 e^{\frac{x}{y}} dx dy.$$

(b) Evaluate (10%)

$$\int_0^2 \int_0^{\sqrt{4-x^2}} \sqrt{4-x^2-y^2} dy dx.$$

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科目：英文【海科學程二年級】

題號：7042  
共 2 頁 第 1 頁

## I. 翻譯（英翻中）

1. Scientists and public officials need to do more to show the public how climate change affects diseases and physical well-being, according to researchers. Human health is largely neglected, if not entirely ignored, in debates about climate change. (10 points)
2. About 800 million people worldwide do not get enough food to eat, while about 1.5 billion are overweight. As the global population expands by an additional 2 billion people by 2050 and climate change alters traditional agricultural areas, scientists and policy makers are racing to figure out how to address both problems. (10 points)
3. A biofuel is a type of fuel whose energy is derived from biological carbon fixation. Biofuels include fuels derived from biomass conversion, as well as solid biomass, liquid fuels and various biogases. (10 points)
4. A typhoon is a mature tropical cyclone that develops in the northwestern part of the Pacific Ocean between  $180^{\circ}$  and  $100^{\circ}\text{E}$ . For organizational purposes, the northern Pacific Ocean is divided into three regions: the eastern (North America to  $140^{\circ}\text{W}$ ), central ( $140^{\circ}\text{W}$  to  $180^{\circ}$ ), and western ( $180^{\circ}$  to  $100^{\circ}\text{E}$ ). Identical phenomena in the eastern north Pacific are called hurricanes. (10 points)
5. A party that had backed a bailout for Greece's failed economy won a narrow victory in parliamentary elections that were largely seen as a last chance for the country to stay in the euro zone. (10 points)
6. Paintings on cave walls in northwestern Spain are far older than previously thought — some of them more than 40,000 years old, scientists said, raising a possibility that Neanderthals were the artists. (10 points)
7. According to polls, two-thirds of Japanese express deep concern about the safety of nuclear plants after last year's accident, which contaminated food with radiation and shattered the myth of Japan's infallible nuclear technology. The day before Japanese Prime Minister gave the order, his government was visited by an antinuclear group led by the Nobel laureate Kenzaburo Oe, which presented what it said were the signatures of 7.5 million people calling for the abolition of nuclear power. (10 points)
8. For years, bacteria have had a bad name. They are the cause of infections and diseases. They are something to be scrubbed away, things to be avoided. But now researchers have taken a detailed look at another set of bacteria that may play even bigger roles in health and disease: the 100 trillion good bacteria that live in or on the human body. No one really knew much about them. They are essential for human life, needed to digest food, to synthesize certain vitamins, to form a barricade against disease-causing bacteria. But what do they look like in healthy people, and how much do they vary from person to person? (10 points)

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## II. 寫作

Write a paragraph of no more than ten sentences to explain the reason(s) why you are taking this exam. (20 points)

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