淡江大學九十一學年度進修學士班轉學生招生考試試題

系別：工組二年級　　　　　科目：微　積　分

准舉項目請打「○」否則打「×」
計　算　機
○

※ 不得在本試題紙上作答，否則不予計分※

一.填空題: 共 10 小題，每題 7 分，只寫答案不必書寫過程。

(a) Let

$$f(x) = \begin{cases} 1 - 2cx + x^2 & \text{if } x \le -1 \\ cx^2 + x + 1 & \text{if } x > -1. \end{cases}$$

What value of $c=$ _____ makes $f(x)$ continuous on $(-\infty, \infty)$?

(b) $\lim\limits_{x \to \infty} \ln(2 + 3x) - \ln x =$ _____

(c) $\lim\limits_{x \to 0} x^2 \cot^2 \pi x =$ _____

(d) Let $f(x) = 3^x$. Then $f'(1) =$ _____

(e) $\dfrac{d}{dx} \displaystyle\int_{x^2}^{x^3} \tan(t^2)\,dt =$ _____

(f) Let f be an increasing function on $[0, 1]$ satisfying $f(0) = 0$, $f(1) = 5$ and $\int_0^1 f(x)dx = 3$. Let f^{-1} be the inverse function of f. Find $\int_0^5 f^{-1}(y)dy =$ _____

(g) $\displaystyle\int \dfrac{x}{x^4 + 81}\,dx =$ _____

(h) Find an equation of the tangent plane to the surface $z = x^3 + y^2$ at the point $(1, 1, 2)$.

(i) Suppose $w = 3x^2 + xy + y^2$, where $x(t)$ and $y(t)$ are differentiable functions with $x(3) = 1$, $y(3) = 2$, $\dfrac{dx}{dt}(3) = -1$, $\dfrac{dy}{dt}(3) = 2$. $\dfrac{dw}{dt}(3) =$ _____

(j) $\displaystyle\int_0^6 \int_{x/3}^2 e^{y^2}\,dy\,dx =$ _____

◀ 注意背面尚有試題 ▶

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本試題共 2 頁

二. 計算題: 共 3 小題，每題 10 分，務必書寫演算過程否則不予計分 •

(1) Find a power series representation for $\ln(1-x)$ and its radius of convergence.

(2) Find the maximum and minimum values of

$$f(x,y) = 2x^2 - 3y^2 - 2x$$

in the region $x^2 + y^2 \le 1$.

(3) Find the volume of the solid lie above the cone $z = \sqrt{x^2+y^2}$ and below the sphere $x^2+y^2+z^2 = 2z$.