

# 元智大學 102 學年度研究所 碩士班 招生試題卷

系(所)別：工業工程與管理  
學系碩士班

組別：不分組

科目：微積分

用紙第 1 頁共 1 頁

●不可使用電子計算機

- (15%) Evaluate the integral  $\iint_R e^{x+y} dA$ , where  $R$  is given by the inequality  $|x|+|y|\leq 1$ .  
(Hint: Use the change of variables to solve it.)
- (15%) Find the dimensions of the box with volume  $1,000 \text{ cm}^3$  that has minimal surface area.
- (15%) Find the radius of convergence and interval of convergence of the series 
$$\sum_{n=1}^{\infty} \frac{(x+2)^n}{n4^n}$$
- (15%) Solve the following differential equation  $(1+\cos x)y' = (1+e^{-x})\sin x$ , given the initial condition  $y(0) = 0$ .
- (10%) Given  $f(x) = x + x^2 + e^x$ , find  $(f^{-1})'(1)$ .
- Determine whether the following statements are true or false. If it is true, explain why. If it is false, explain why or give an example that disproves the statement.
  - (5%) If  $f'(c)$  exists, then  $\lim_{x \rightarrow c} f(x) = f(c)$ .
  - (5%) If  $f'(x) = g'(x)$  for  $0 < x < 1$ , then  $f(x) = g(x)$  for  $0 < x < 1$ .
  - (5%) If  $f$  is continuous on  $[a, b]$  and  $f(x) \geq 0$ , then  $\int_a^b \sqrt{f(x)} dx = \sqrt{\int_a^b f(x) dx}$ .
- (15%) Analyze and sketch the function  $y = \sqrt{x^2 + x} - x$ . Name any intercept, asymptotes, symmetry, extrema, etc. if applicable.

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