

國立中山大學 105 學年度寒假轉學考招生考試試題

科目名稱：微積分【應數系二年級】

題號：20401

※本科目依簡章規定「不可以」使用計算機

共 1 頁第 1 頁

請詳列計算過程。

1. (a) Find  $f'(2)$  and  $f''(2)$ , where  $f(x) = xe^{x^2}$ . (10%)  
(b) Find all relative extreme values of  $f(x) = \frac{x^2+1}{x}$ . (10%)
2. (a) Evaluate  $\int_{-1}^1 x \sin(n\pi x) dx$ . (10%)  
(b) Evaluate  $\int_0^\infty te^{-2t} dt$  if it is convergent. (10%)
3. (a) Find the Taylor series about  $x_0 = 2$  of  $f(x) = xe^x$ . (10%)  
(b) Find the interval of convergence of the power series  $\sum_{n=1}^\infty 2^n(x-1)^{n+2}$ . (10%)
4. (a) Find the directional derivative of  $f(x, y) = x^2 - xy + y^2 - 2y - 3$  at the point  $(1, 0)$  in the direction  $\langle 1, -1 \rangle$ . (10%)  
(b) Find all relative extreme values of  $f(x, y) = 2x^2 - 4x + 2y^2 - 8y - 12$ . (10%)
5. (a) Let  $E = \{(x, y) | 0 \leq x \leq 1, 0 \leq y \leq 1, 0 \leq x^2 + y^2 \leq 1\}$ . Evaluate the double integral  $\iint_E xy dA$ . (10%)  
(b) Evaluate the triple integral  $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} 2z dz dy dx$ . (10%)