

南華大學九十一年度碩士班招生考試試題卷

系所別：環境管理研究所

科目：微積分

用紙第

頁共

頁

1. a. If  $f(x) = 3e^x$ , please find  $f'(x)$ . (5%)  
b. If  $f(x) = x^3 2^x$ , please find  $f'(x)$ . (5%)  
c. If  $z = 3y^2$ ,  $y = 2x + 5$ , please find  $\frac{dz}{dx}$ . (5%)  
d. If  $z = f(x, y) = 2x + xy - y^2$ ,  $x = g(y) = 3y^2$ , find  $\frac{dz}{dy}$ . (7%)

2. a.  $\lim_{x \rightarrow 4} \frac{x^2 - x - 12}{x - 4} = ?$  (5%)

b.  $\lim_{x \rightarrow 0} \frac{5^x - e^x}{x} = ?$  (5%)

c.  $\lim_{x \rightarrow \infty} x \ln x = ?$  (5%)

d.  $\lim_{x \rightarrow 0^+} x^x = ?$  (5%)

3. a. Find  $\int (5e^x - x^{-2} + \frac{3}{x}) dx$  (5%)

b. Find  $\int_0^4 (\frac{1}{1+x} + 2x) dx$  (5%)

c. Find  $\int_0^2 (2x^3 - 1)^3 x^2 dx$  (7%)

4. Solve the following differential equations

a.  $\frac{dy}{dt} + 2ty = 0$  (7%)

b.  $2yt^3 dy + 3y^2 t^2 dt = 0$  (10%)

5. If  $x \sin \pi x = \int_0^{x^2} f(t) dt$ , where  $f$  is a continuous function, find  $f(4)$ . (10%)

6. Find the local maximum and minimum values and saddle points of the function  $f(x, y) = x^3 - 3xy + y^3$ . (14%)