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# 淡江大學 97 學年度轉學生招生考試試題

系別：商管組三年級

科目：微 積 分

可否使用計算機			
可		否	✓

本試題共 5 大題， / 頁

1. Evaluate each of the followings. (7% each)

(a)  $\int \frac{xe^x}{(x+1)^2} dx$

(b)  $\int x^2 \ln x dx$

(c)  $\int_0^1 \int_x^1 e^{y^2} dy dx$

(d)  $\lim_{x \rightarrow 0} \frac{(x+9)^{\frac{3}{2}} - 27}{x}$

(e)  $\frac{d}{dx} (x^2 + 1)^x$

(f)  $\frac{d}{dx} e^{x^2} \cdot \ln(x^2 + 1)$

2. Find the area of the region bounded by  $y = \frac{1}{x^2}$ ,  $y = x$ ,  $y = 8x$  for  $x \geq 0$ . (14%)

3. Determine all Taylor polynomials of  $f(x) = 3x^2 - 17$  at  $x = 3$ . (14%)

4. Use Lagrange multipliers to find the values of  $x, y, z$  that minimize the objective function

$$f(x, y, z) = 11xy + 14yz + 15xz$$

subject to the constraint.

$$xyz = 147,840 \quad (14\%)$$

5. (a) A hungry college student, in a rush to eat, turns the oven on and puts a frozen pizza in it, without preheating the oven. Let  $f(t)$  denote the temperature of the pizza and  $T(t)$  the oven's temperature,  $t$  minutes after the oven was turned on. According to Newton's law of cooling, the rate of change of  $f(t)$  is proportional to the difference between the oven's temperature and the temperature of the pizza. Find a differential equation that is satisfied by  $f(t)$ . (6%)

(b) Suppose that the oven's temperature in (a) is given by  $T(t) = 70 + 50t$  for  $0 \leq t \leq 8$ . Suppose further that the constant of proportionality is  $k = 0.1$  and that the initial temperature of the frozen pizza was  $27^\circ$ . Determine the temperature of the pizza during the first 8 minutes of heating. (10%)