招生學年度	100	招生類別	碩士班
系所班別	運籌管理研究所碩士班(乙組)		
科目	微積分		
注意事項	本考科可使用掌上型計算機		

1 (30%) Determine the values of the following questions.

(a) $\int_0^{\pi/2} \cot t \, dt$ (b) $\lim_{x\to 0} x^{(1/\ln x)}$ (c) $\int (\ln x)^2 dx$

2 (20%) Find the values of x for which the following power series converge. Include a discussion of the endpoints.

(a) $\sum_{n=0}^{\infty} (-1)^n (n+1) x^n$ (b) $\sum_{n=1}^{\infty} \frac{(x+2)^n}{\sqrt{n}}$

3 (10%) Use Simpson's Rule with $2n = 4$ to compute the approximate value for $\int_1^2 \frac{dx}{x}$. Keep five decimal places in each term and round off the result to four decimals.

4 (10%) Find the area bounded by $y = \sqrt{x}$ and $y = x^3$.

5 (10%) Water is flowing into a vertical cylindrical tank of radius 2ft at the rate of 8 ft^3/min. How fast is the water level rising?

6 (10%) Find the critical points of $f(x, y, z) = x^2 + y^2 - 2z^2 + 3x + y - z - 2$.

7 (10%) Evaluate the integral $\iiint_S f(x, y, z) dV$ where $f(x, y, z) = z^2$ and S is bounded by the surfaces $z = 0$, $x^2 + z = 1$, $y^2 + z = 1$.