

題號： 254
科目：微積分(B)
節次： 7

國立臺灣大學107學年度碩士班招生考試試題

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1. Express d^2y/dx^2 in terms of x and y for $\sin^2x + \cos^2y = 1$. (10%)
2. Find the critical numbers and classify the extreme values for $f(x) = x\sqrt{4-x^2}$.
(10%)
3. Calculate. (20%)
(a) $\int \frac{x+1}{x^3+x^2-6x} dx$ (b) $\int \cos\sqrt{x} dx$
4. Sketch the polar curve $r = 1 + \cos\theta$, and find the area, and the coordinates of the centroid of the region enclosed by the curve. (15%)
5. Test the following series for absolute convergence, conditional convergence, or divergence. (15%)
(a) $\sum \left(\frac{k}{k+1}\right)^k$ (b) $\sum \frac{\cos(k\pi)}{k}$
(c) $\sum \frac{\sin(\pi k/2)}{k\sqrt{k}}$
6. Maximize $x^2 + y^2$ on the curve $x^4 + 7x^2y^2 + y^4 = 1$. (10%)
7. Calculate the area of the surface $z = a^2 - (x^2 + y^2)$ with $a^2/4 \leq x^2 + y^2 \leq a^2$. (10%)
8. Calculate the total flux of $\vec{v} = 2x\vec{i} + xz\vec{j} + z^2\vec{k}$ out of the solid bounded by the paraboloid $z = 9 - x^2 - y^2$ and the xy -plane. (10%)

試題隨卷繳回