題號： 244　　國立臺灣大學 110 學年度碩士班招生考試試題

科目： 微積分(B)

節次： 7

1. Sketch the figure of function $(x^3-1)/x$ and indicate the extrema, inflection points, and concavity. (20%)
2. Calculate the given integral. (a) $\int_{-\pi/2}^{\pi}|\cos x|dx$; (b) $\int\frac{\sin^{-1}2x}{\sqrt{1-4x^2}}dx$; (c) $\int\frac{1}{x^4-1}dx$. (15%)
3. State whether the sequence converges as $n\to\infty$; if it does, find the limit.

   (a) $\lim_{x\to 0}(\frac{1}{\sin x}-\frac{1}{x})$　　(b) $n\left(a^{1/n}-1\right), a>0$ (10%)
4. Find the unit tangent, the principal normal, the curvature and write an equation in x, y, z for the osculating plane at the point on the curve $\vec{r}(t)=e^t\vec{i}+e^{-t}\vec{j}-t\sqrt{2}\vec{k}$ at t=0 and find the length from t=0 to t=ln3. (15%)
5. Expand sin(x) in powers of $x-\pi$ and specify the values of x for which the expansion is valid. (10%)
6. Let $\vec{v}=2x\vec{i}+2y\vec{j}+(xyz)^2\vec{k}$ and S be the lower half of the ellipsoid. $\frac{x^2}{4}+\frac{y^2}{9}+\frac{z^2}{27}=1$. Calculate the flux of $\nabla\times\vec{v}$ in the direction of the upper unit normal. (15%)
7. Take Ω as the parallelogram bounded by $x+y=0, x+y=1, x-y=0, x-y=2$. Evaluate $\iint_\Omega 4xydxdy$. (15%)

試題隨卷繳回