

國立臺灣大學數學系
九十六學年度博士班入學考試試題
科目：幾何與拓樸

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1. Topological space $X = \{ z = x+iy \in \mathbb{C} \mid z \neq 0, z \neq 1, z \neq i \}$ Cohomology groups $H^0(X) = ?$
 $H^1(X) = ?$ (25/100)
2. Cone $C = \{ x^2 + y^2 = z^2 \}$, $C \cap \{ x - 2y + 3z = 4 \}$ is a conic section. At $(x, y, z) = (-3, 4, 5)$ curvature $k = ?$ (25/100)
3. $y = x^2$ is a parabola, $ds = \sqrt{dx^2 + dy^2}$ is the differential of arclength. Curvature integrals of the parabola $P \int_P k ds = ?$ (25/100)
4. $y \div x = \tan z$ is a helicoid. At $(x, y, z) = (1, 1, \pi/4)$, $\vec{V} = (1, -1, -1)$ is a tangent vector. Parallel translate \vec{V} along $\gamma(t) = (t, t, \pi/4)$ from $t=1$ to $t=0$, $\vec{V}(t=0) = (?, ?, ?)$
(25/100)