All-round (3 problems)

1. Suppose $f(z_0, z_1, z_2, z_3)$ is a degree 2 homogeneous polynomial and its zero set S is a smooth submanifold in CP^3. Then S is called a smooth degree 2 complex hypersurface in CP^3.

a). Compute the Euler number of S.

b). Suppose that $f(z_0, z_1, z_2, z_3) = z_0 z_3 - z_1 z_2$. Identify the zero set as a familiar 4 dimensional manifold.

2. Show that a positively curved noncompact surface in $\mathbb{R}^3$ has infinite area.

3. If M is a compact manifold with negative sectional curvature, then the fundamental group of M is of exponential growth.