tiplicity, means $\sum_{p\in S}(v(p)-1)$.

$\Rightarrow$ From $g(S) = n\cdot(g(S')-1)+1+\frac{1}{2}\sum_{p\in S}(v(p)-1)$,

$$\sum (v(p)-1) = 2g(S) - 2n\cdot(g(S')-1) \text{ is even.}$$

I hope my guess is right!

The latter follows also from the fact that a Riemann surface of genus g has exactly g linearly independent holomorphic 1-forms on it; if $f: S \longrightarrow S'$ is nonconstant, it is easy to see that $f^*: H^0(S', \Omega^1_{S'}) \longrightarrow H^0(S, \Omega^1_S)$ is injective, and hence $g(S) \geq g(S')$.

Pf $\dim H^0(S, \Omega^1_S) = g$ = genus of S

Given $\tilde{\omega} \in H^0(S', \Omega^1)$ s.t. $f^*\omega = 0$, $\tilde{\omega}$ can be written locally as $\tilde{\omega} = g(\omega)\, d\omega$.

$\Rightarrow$ $f^*\tilde{\omega} = 0 = f^*g\ dz = 0$ $\Rightarrow$ $f^*g = 0$
$\Rightarrow$ $g\circ f(z) = 0$ $\Rightarrow$ $g\circ f = 0$ $\Rightarrow$ $g = 0$ since f is not constant. $\Rightarrow$ $\tilde{\omega} = 0$ $\Rightarrow$ f^* is injective.

The Genus Formula

We will give here three proofs of the genus formula, which gives the genus of a smooth plane curve in terms of its degree.

First, the topological argument. Suppose $S \subset$