Homework #1 for Math 136

Due date: Wednesday Sept. 29, 2004

From Hsiung's book:
Page 82: #7
Page 87: #6, #7

Additional problem:

A function $f : \mathbb{R} \to \mathbb{R}^n$ is called *periodic* if there exits a $\tau > 0$ such that $f(t+\tau) = f(t)$ for any $t \in \mathbb{R}$. The number τ is called *a period* of the function $f(t)$.

Now assume that for a function $f : \mathbb{R} \to \mathbb{R}^n$ there is a sequence $\{\tau_n\}_{n=0}^{\infty}$ such that each τ_n is a period of $f(t)$ and

$$\lim_{n\to\infty} \tau_n = 0.$$

1): Prove that if $f(t)$ is also differentiable, then $f(t)$ is a constant.

2): What if $f(t)$ is only continuous? Either prove $f(t)$ is still a constant in this case, or give a counterexample.