1. Show that if $\{f_n\}$ converges to f uniformly on $A \subseteq \mathbb{R}$ then it converges pointwise on A.

2. Show that $\{f_n\}$ converges to some f uniformly on $A \subseteq \mathbb{R}$ then $\{f_n\}$ is Cauchy with respect to the uniform norm.

3. Show that if $f(x)$ is differentiable on $\mathbb{R}$ and for all $x \in \mathbb{R}$, $f'(x) = f(x)$ and $f(0) = 1$ then $f(x) = \exp(x)$.

4. Let $0 < L < 1$ and $f_n(x) = \sum_{k=0}^{n} x^k$. Show that f_n converges uniformly to some f on $[-L, L]$.

5. Show:

$$\ln(2) = \lim_{n\to\infty} \sum_{k=1}^{n} \frac{1}{k \cdot 2^k}$$

6. Show that $\ln(2) > \frac{2}{3}$.