(1) Let $D = \{ |z| < 1 \}$ and $H(D)$ be the space of holomorphic functions on $D$. Show that $F \subset H(D)$ is normal if and only if there is a sequence $\{ M_n \}$ of positive constants such that $\limsup \sqrt[n]{M_n} \leq 1$ and $|a_n| \leq M_n$ for all $n$ and all $f(z) = \sum_{n=0}^{\infty} a_n z^n \in F$.

(2) Let $G$ be a connected open set in $\mathbb{C}$ and $H(G)$ be the space of holomorphic functions on $G$. For a sequence $\{ f_n \} \subset H(G)$ of one-to-one functions which converge to $f \in H(G)$, show that $f$ is either one-to-one or a constant function.

(3) Let $G_1, G_2 \subseteq \mathbb{C}$ be simply connected open sets and $f : G_1 \to G_2$ be a biholomorphic map from $G_1$ to $G_2$. Suppose that $f(z_1) = z_2$. Show that for every one-to-one holomorphic map $g : G_1 \to G_2$ satisfying $g(z_1) = z_2$, $|g'(z_1)| \leq |f'(z_1)|$.

(4) Let $f(z)$ and $g(z)$ be entire functions such that $e^{f(z)}, e^{g(z)}$ and 1 are linearly dependant over $\mathbb{C}$, i.e., there exist $c_1, c_2, c_3 \in \mathbb{C}$, not all zero, such that $c_1 e^{f(z)} + c_2 e^{g(z)} + c_3 = 0$ for all $z$. Then $f(z), g(z)$ and 1 are linearly dependant over $\mathbb{C}$.

(5) Let $f(x, y)$ and $g(x, y)$ be real-valued harmonic functions on $\mathbb{R}^2$ such that $e^{f(x, y)}, e^{g(x, y)}$ and 1 are linearly dependant over $\mathbb{R}$. Then $f(x, y), g(x, y)$ and 1 are linearly dependant over $\mathbb{R}$.