1. $f = u + iv$ is holomorphic in D. Show that if $u^2 + v^2$ is constant, then f is constant.

2. (for grade) $u = x^2 - y^2 + ax$. Find all v such that $f = u + iv$ is holomorphic for all $z \in \mathbb{C}$.

3. (for grade) $f(z) = e^{-1/z}$ when $z \neq 0$. Show that Cauchy-Riemann equations are satisfied for all $z \in \mathbb{C}$, $z \neq 0$.

4. $f = \sum_{k=0}^{\infty} c_k x^k$ find all c_k such that f is holomorphic.

5. (for grade) Find the radius of convergence of

$$\sum_{n=2}^{\infty} \frac{z^{2n+1}}{(2n+1)!}, \quad \sum_{n=1}^{\infty} \frac{n!}{n^n} z^n$$

6. Find the domain of convergence of

$$\sum_{n=1}^{\infty} n(z-i)^n$$

7. Let f be an entire function (analytical in $\mathbb{C}$) of the form $f(x, y) = u(x) + iv(y)$.

8. (for grade) B.Ch. p.121, 3

9. B.Ch. 136, 8,9,10.