1. Prove that if (f, D) is a holomorphic function element satisfying a differential equation

$$P(f, f', f'', \ldots, f^{(n)}) = 0,$$

(where P is a polynomial) and f_γ is its analytic continuation along a path γ, then f_γ satisfies the same differential equation.

2. Given the previous point, study the analytic continuation of the solution of the differential equation

$$z\frac{df}{dz} - \alpha f = 0, \quad \alpha \in \mathbb{C},$$

around the origin. (Be sure to include in the discussion the dependency on the parameter α.)