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Some Precise Estimates of the Hyper Order of Solutions of Some Complex Linear Differential Equations

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Abstract:

Let $\rho(f)$ and $\rho_2(f)$ denote respectively the order and the hyper order of an entire function f. In this paper, we obtain some precise estimates of the hyper order of solutions of the following higher order linear differential equations

$$f^{(k)} + \sum_{j=0}^{k-1} A_j(z)\, e^{P_j(z)} f^{(j)} = 0$$

and

$$f^{(k)} + \sum_{j=0}^{k-1} \left(A_j(z)\, e^{P_j(z)} + B_j(z) \right) f^{(j)} = 0$$

where $k \geq 2$, $P_j(z)$ $(j = 0, \ldots, k-1)$ are nonconstant polynomials such that $\deg P_j = n$ $(j = 0, \ldots, k-1)$ and $A_j(z)$ $(\not\equiv 0)$, $B_j(z)$ $(\not\equiv 0)$ $(j = 0, \ldots, k-1)$ are entire functions with $(j = 0, \ldots, k-1)$. Under some conditions, we prove that every solution $f(z) \not\equiv 0$ of the above equations is of infinite order and $\rho_2(f) = n$.