ON RADially SYMMETRIC SOLUTIONS OF SECOND AND HIGHER ORDER NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS

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Abstract. Explicit radially symmetric entire and non-entire solutions are obtained for the equations of the form

$$\Delta^k u + P(r)f(u) = 0, \quad k \geq 1$$

(1.1)

where $P(r)$ is a suitable function, $\Delta$ denotes $n$-dimensional Laplace operator and $\Delta^k$ is the $k^{th}$ iterate of $\Delta$. In particular, the cases

$$f(u) = \pm bu^{n+2k \over n-2k}$$

where $b$ is a positive constant, are considered. For $n = 2$, infinitely many entire solutions of

$$\Delta u + be^u = 0$$

and non-entire solutions of

$$\Delta u = be^u$$

are derived. Explicit solutions of some nonlinear Dirichlet and Neumann problems and some singular nonlinear ordinary differential equations are also determined. These results are consequence of a differential inequality or appropriately chosen form of the solution.


Key words and phrases: Laplace operator, explicit radially symmetric solutions, entire and non-entire solutions, singular ordinary nonlinear differential equations.

REFERENCES


