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## Lambert W Lines and Metamaterials

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The Lambert W function has been used in solving a variety of diverse problems in a variety of topics in physics, chemistry, engineering and mathematics. In physics, it has been useful in the study of statistical distributions such as the Planck black body, Fermi-Dirac and Bose-Einstein distributions and the fringe fields associated with a parallel plate capacitor, the study of thermoelectric as well as metamaterials and solar cells. For metamaterials, a geometric analytic solution is employed in 2 complex planes, where one plane is the inverse Lambert W mapping of the other and the solutions are the intersection of the associated radial equation and the Lambert lines.

In this work, we have analyzed the Graded Index Metamaterial (GIM) Waveguide problem discussed by Xu et al (2013) and given a Lambert W interpretation for the model. The solution set is a subset of the solutions of the radial equation and the corresponding Lambert lines. Some key differences that exist between previously discussed models and the GIM models are analyzed. The solution of the GIM Model is represented as the intersection of the radial equation and family of the solution obtained from the intersection of two perpendicular Lambert Sheets.

### Keyword-1

Lambert W Function

### Keyword-2

Lambert Lines

### Keyword-3

Metamaterials

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