

Fixed point results for generalized Reich-type rational contractions in b -metric spaces

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INTRODUCTION & AIM

The theory of fixed points is essential to nonlinear analysis and its applications. In this study, generalised Reich-type rational contractions in complete b -metric spaces are studied, and fixed point existence and uniqueness results are established.

METHOD

Let (\mathcal{W}, φ) be a complete b -metric space.

- Let $\mathcal{S}: \mathcal{W} \rightarrow \mathcal{W}$ satisfy a rational contraction of the generalised Reich type.
- Create the iterative sequence $\mathcal{P}_{v+1} = \mathcal{S}\mathcal{P}_v$.
- Demonstrate that $\{\mathcal{P}_v\}$ is a Cauchy sequence.
- To achieve convergence, use completeness.
- Verify the fixed point's existence and uniqueness.

RESULTS & DISCUSSION

- Fixed point results for Reich-type rational contractions are proven in the case of complete b -metric spaces.
- The Picard iterative sequence will converge to a fixed point.
- The resulting fixed point is unique.
- The result generalizes the contraction principle due to Banach and Reich.
- It remains true in the more general case of b -metric spaces.
- This approach can be used to deal with nonlinear equations and optimization problems.

CONCLUSION

In complete b -metric spaces, the existence and uniqueness of fixed points were proven. The result obtained extended the concepts of classical Reich-type contraction.

FUTURE WORK / REFERENCES

Applications to graph theory, differential equations, and multivalued mappings.