Project title: Problems in analysis

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General area: Mathematics

Description: Choice of several related problems:

1. *Exploring the point-to-set Principle and the bridges between complexity Theory and Geometric Measure Theory.* Recently there has been some interesting development which connects asymptotic Kolmogorov complexity to the Hausdorff cimension of a set in R^n. It remains to see in the future how deep are the connections between the two subjects.

2. *Introduction to Kakeya sets*. The null sets in R^n which contain a unit line segment in every direction are called Besicovitch sets or Kakeya sets. They can have measure theory but a famous conjecture says these sets have full dimension. These sets are very interesting and their study is connected to many deep problems across Harmonic Analysis and Fractal Geometry.

3. *A study of Embedding Theorems in Metric Geometry.* When can one Metric space be embedded into another? We know a lot of partial answers but there are lot of deep problems even for 'nice' metric spaces.

Requirements: Basic analysis.

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