## Exercise 14

Why doesn't the method of spherical means work for two-dimensional waves?

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**Solution**

The method of spherical means doesn't work for two-dimensional waves because Huygen's principle does not hold in two dimensions (or any even number of dimensions for that matter). A solution to the wave equation in three dimensions travels exactly at speed $c$ and is localized on an expanding spherical surface: it obeys Huygen's principle. However, in two dimensions a solution to the wave equation lies not only on the boundary of an expanding disk but within it as well: it disobeys Huygen's principle. In order to obtain the solution to the wave equation in an even number of dimensions, one should use the method of descent.