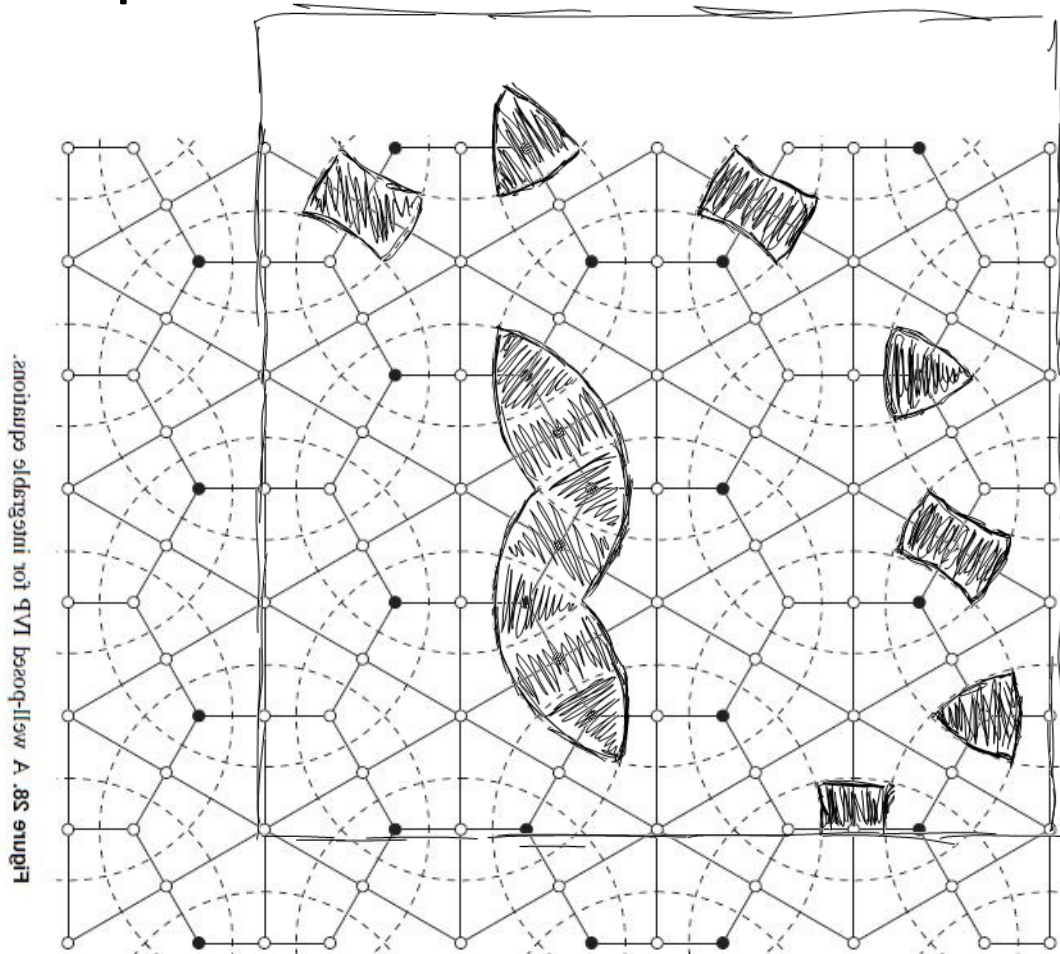# Well-posed

Figure 28. A well-posed IVP for integrable equations.

Initial value problems (IVPs) for equations on graphs come in four flavours: under-determined, over-determined, nearly well-posed, and well-posed. An IVP is well-posed if for generic initial values a solution exists and is unique. In Well-posed, one can specify values to the black dots (aka the Cauchy subgraph) and use an integrable equation, on each kite, to determine the value of each white dot. The graph in Well-posed is called the deltoidal trihexagonal tiling.

The circles are characteristic lines. They intersect each kite in opposite edges. Because the characteristic lines are closed, the equation does need to satisfy a consistency condition, which is a hallmark of integrability.

The Cauchy subgraph in Well-posed is not connected. There is one connected component, comprising seven initial values, and infinitely many isolated components. The connected component plays a special role. It represents the seeds, a small bang. It is where evolution begins.

In Well-posed, all colours mingle, and those of the connected component reappear, scattered.