# TMATH 342: WrittenHW 5

Read

- "Extracting Insights from the shape of complex data using topology" by Lum et al.

- "Modeling: A Structured Process" by Oropesa & Cortez.

1. Recall Oropesa & Cortez's article on "Modeling: A Structured Process".

   (a) [2] Describe how the model for the lost cell phone was validated and led to a better model.

   (b) [3] Reflect on your own experiences. Have you ever approached a (mathematical or otherwise) problem (in the curriculum or outside of it) in a way that fits with the modeling cycle described in this article? If so, provide a narrative summary that follows the six described in the article. (Keep your narrative less than a page!)

2. [4] Consider the figure shown below, as a topological space, $X$ whose topology is inherited from $\mathbb{R}^2$. Define $f : X \to \mathbb{R}^1$ (lens) defined as $f(x, y, z) = z$. Use the (rainbow colored) open sets $U_1$, $U_2$, $U_3$, $U_4$, $U_5$, and $U_6$ below on $\mathbb{R}^1$ to use the Mapper algorithm transforming the figure into a graph.
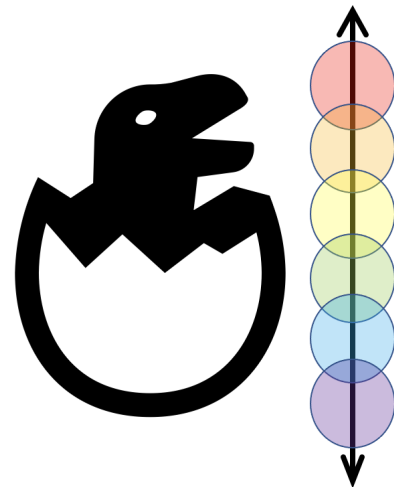
3. Consider the data plotted in $\mathbb{R}^2$ below.

   (a) [2] Choose a function (lens) to map the data to $\mathbb{R}^1$. Provide some reasoning for your choice.

   (b) [2] Choose open sets to cover $\mathbb{R}^1$. Provide some reasoning for your choice.

   (c) [2] Use the Mapper algorithm with the lens and cover you choose to turn the data in to a graph.
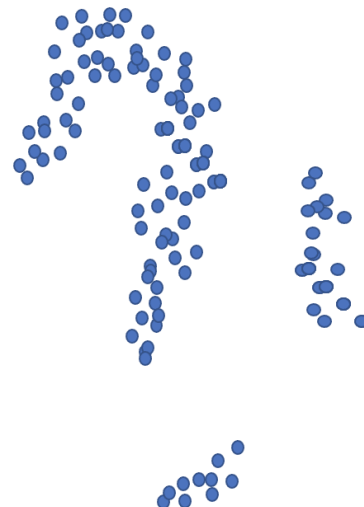
Note, in this class, it is more important to communicate clearly, than it is to be correct! Make sure that you edit your work (and your peers!!) so that your completed homework is easily understood!