

## Video Essay Questions

### Sphere Inside Out

1. How does this relate to what we're doing in class? How is it the same, how is it different?
2. How is the video's idea of  $S^2$  different than the one we use in class? What extra property does their  $S^2$  have?
3. Explain why the final transformation is not an isotopy?
4. Why is ripping or tearing not allowed? (Hint: Think about curves with rips, they fail to be...)
5. Why is creasing not allowed? (Hint: Think about curves with sharp edges, they fail to be...)
6. Briefly describe the idea of a turning number for a curve in  $\mathbb{R}^2$ . What does it tell us about turning a circle inside out? Why doesn't the idea of turning number work for the sphere in  $\mathbb{R}^3$ ?
7. Do you think you can turn  $S^3 \subset \mathbb{R}^4$  inside out? Why or why not?

### Wind and Mr. Ug

1. Give 3 different properties of the Möbius band and explained how they are demonstrated in the video.
2. Will Wind find her dog? If not, why not? If so, will it be exactly as it was?

### Möbius Strip Activities

For this video, treat it as a science lab. Perform the activities demonstrated in the video. You will need paper, tape, and a scissors. Pause the video as needed and answer the questions that are posed on screen. You do not need to write a coherent essay on this video, simply perform the experiments and answer the questions.

### Not Knot

1. How does this relate to what we're doing in class?
2. More questions to come ...

### Rubber band into a knot (Extra Credit: 15 points)

1. The narrator really isn't working with a circle. What familiar space is he really turning into a knot?
2. What would happen if the cut stayed vertical all the way around the rubber band? What if he only twisted a 1/2 turn instead of a 3/2 turn?
3. Describe a topological gluing process for turning a 3-manifold in the shape of a trefoil into a solid torus?

Random Fun Fact: The narrator in the rubber band video is the father of the narrator in Wind and Mr. Ug!