

Space: Its Light, Its Shape.

Chapter 6: Products

Assignment: For Monday, January 31, 2005

- Read Chapter 6.
- Though everyone is responsible for reading all of the material and for working out all of the exercises, teams have been assigned specific material and exercises for which they are responsible in class presentations. You may want to come to class early to firm up and smooth out the exercises with your teammates.

Team 2: Illustrate why a cylinder is both a circle of intervals and an interval of circles. What notation do we use for this?

Team 3: Illustrate why a torus is a “circle of circles.” What notation do we use for this?

Team 4: What do we mean if we say something is a topologically a product? Can we give a definition for this?

Team 1: Present Exercise 6.1.

Team 2: Present Exercise 6.3.

Team 3: What do we mean if we say something is a product both in the topological and the geometrical sense?

Team 4: Present Exercise 6.5.

Team 1: How can we describe the donut surface as a geometrical product?

Team 2: Describe how we can think of the three-torus as the product of a torus and a circle.

Team 3: Is the (flat) three-torus also a geometrical product? Explain.

Team 4: Present Exercise 6.6.

Team 1: Describe $S^1 \times S^1$ as perceived by us Spacelanders. Describe it as perceived by Flatlanders. What are some of the obstacles for the Flatlanders? What are some of the mental “tricks” they use?

Team 2: Describe $S^2 \times S^1$ as perceived by us Spacelanders. What are some of the mental “tricks” we can use to try to understand this manifold?

Team 3: What surprising issues are raised by the grey spherical cross-section of $S^2 \times S^1$ illustrated in Figure 6.10?

Team 1: How do the issues raised in the previous question look in the white flat toroidal cross-section of $S^2 \times S^1$ illustrated in Figure 6.10?

Team 2: The answers to the two questions above tell us about a strange property of $S^2 \times S^1$. What is this property and what new term do we introduce to capture it?