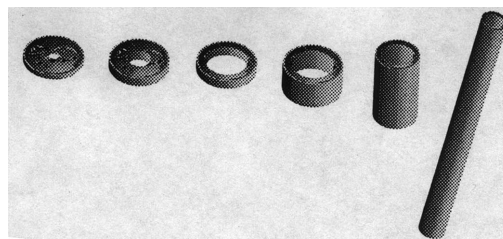


MCS-115

Answers to Homework: 5.1

5.1.6 Removing the two intersection points leaves the theta curve in three pieces, whereas removing *any* two points on the circle always leaves exactly two pieces.

5.1.9 A straw and a half dollar with a hole drilled in the center are equivalent. It doesn't matter whether you view the objects as having thickness or not. If you viewed them as ideal two-dimensional objects, the straw is a cylinder, and the defaced coin is a disk with a hole in it. Deform the straw so that the bottom of the straw is the same radius as the drilled hole and stretch the top so that it is as wide as the coin. Now squash the straw vertically so that the entire straw lies in a single plane. Voila, you've deformed the straw into the coin. A similar process works for the thickened three-dimensional objects.



5.1.11 Yes, they are equivalent. The short answer is that they both have a single hole in them. To really show equivalence, it's necessary to describe the distortion that turns one object into the other. For example, take your gumby-like coffee mug, flatten out the part that holds coffee so that it looks like a flat disk connected to a ring. Now shrink the disk so that the resulting object looks more like a ring with a bump. Smooth out the bump, thicken the ring, and you've got yourself a gumby-like doughnut.