Zachary Weiss

ME570 HW2

Professor Tron

5 October 2020

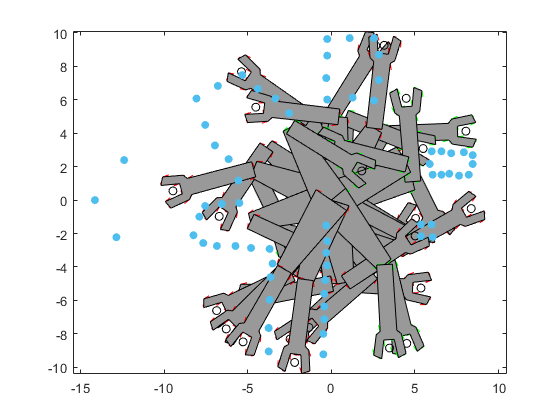
*Q1.1*:

1. R1(θ) represents a 2-D CCW rotation on the x2 x­3 plane.
2. R2(θ) represents a 2-D CCW rotation on the x1 x­3 plane.
3. R3(θ) represents a 2-D CCW rotation on the x1 x­2 plane.
4. R4(θ) represents a 2-D CCW rotation on the x1 x­2 plane, which is then negated (in other words, an additional π rad CCW atop the theta input).

*Q2.1*:

1. and

*Q2.2*:



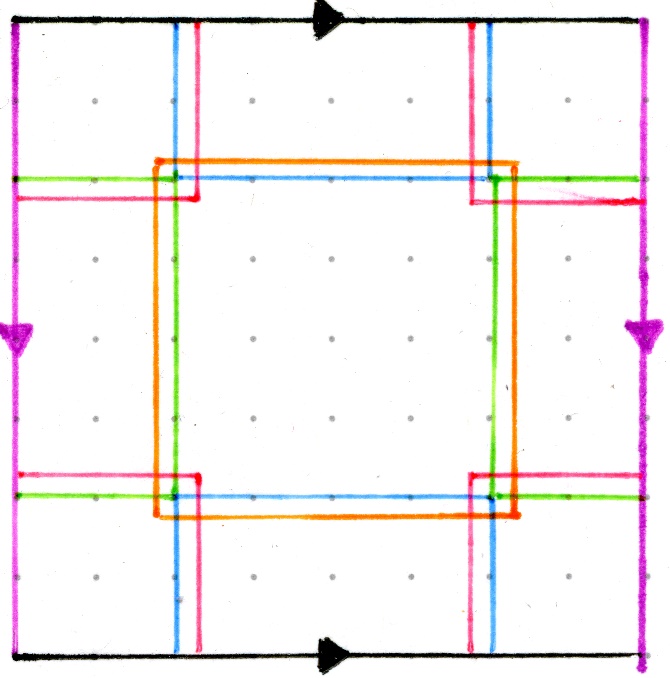
*Q4.1*:

(Also demonstrable by comparing to mapping between complex numbers and angle, I believe).

Show:

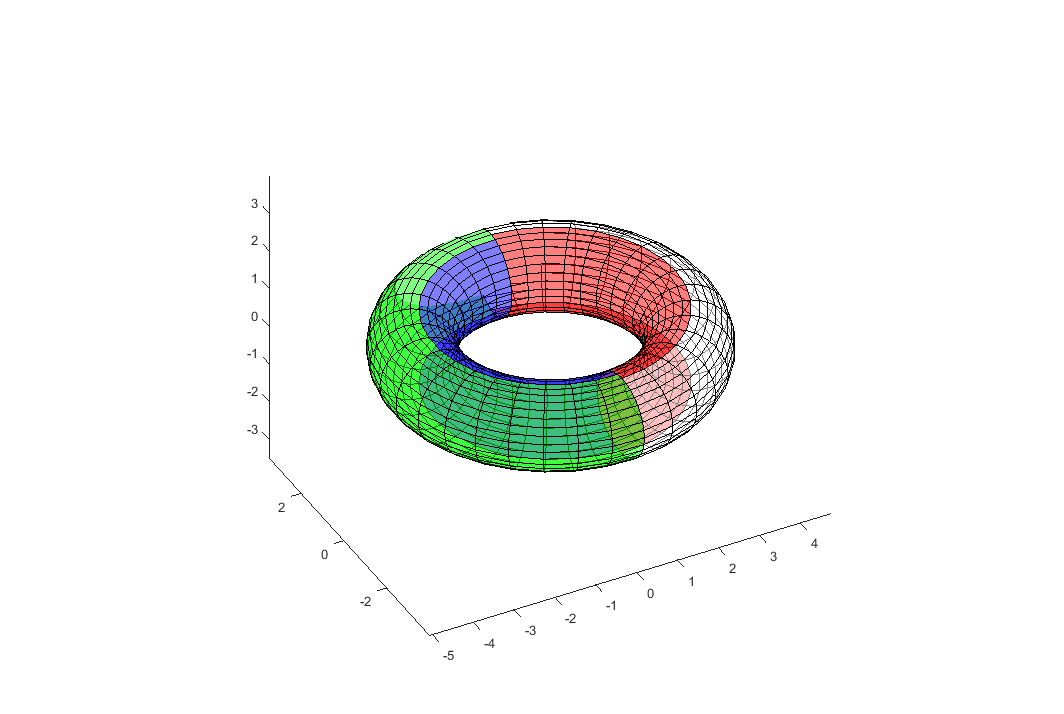
*Q5.1*:

As , and requires 2 charts, it follows easily that for , 4 is sufficient. Pictured on a flat torus and with the restriction of only using square regions within , it becomes evident that 4 is necessary as well:



*Q5.2*:

The same charts, as applied to the surface of the torus in 3D, with the colors green, blue, red, and white, respectively.

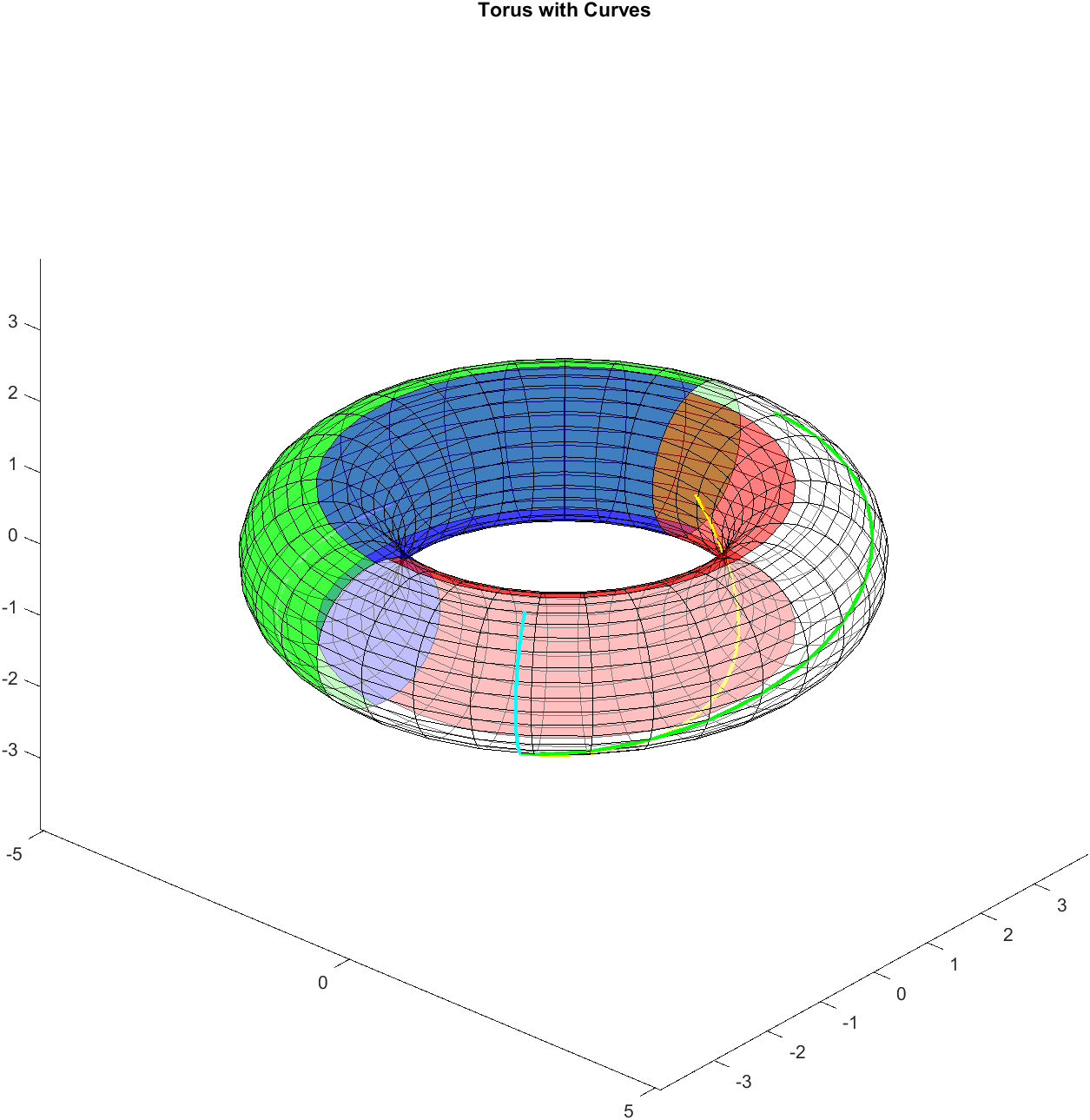


*Q5.3*:

If charts self-overlapped, the mapping would no longer be diffeomorphic; the same point on the surface could be represented multiple ways on a single chart, defeating the chart’s purpose. If sections of the torus were uncovered, one would not have a full atlas of the topology; there would exist points in the space that one could not map to, again defeating the purpose.

*Q5.4*:

*Q5.5*: Torus with curves.



Q6.1:

Q6.2:

Q6.3:

Q6.4:

Q7.1: