Math 2106-D, Foundations of Mathematical Proof
Homework 1
Due August 31, 2017

Do the following problems from Hammack:
§1.1: 16, 26, 32, §1.2: 8, 14 §1.3: 8, 12, 14 §1.4: 8, 18, 20 §1.5: 2 §1.6: 2 §1.7: 6 §2.1: 2, 4, 6, 14 §2.2: 8 §2.3: 2, 8 §2.4: 4 §2.5: 6, 8 §2.6: 6, 12

Additional exercises

A1 The *Inclusion-Exclusion Principle*, which you saw on Worksheet 1, states that for finite sets A, B,

$$|A \cup B| = |A| + |B| - |A \cap B|.$$

Use this principle to determine the number of integers $n \in \{1, 2, \ldots, 2017\}$ which are not divisible by 2 or 3.

A2 For any $\alpha \in \mathbb{R}$, let $X_\alpha = \{(x, y, \alpha) \mid x, y \in \mathbb{R},\ x^2 + y^2 = 1 - \alpha^2\} \subseteq \mathbb{R}^3$.

What geometric object is

$$\cup_{\alpha \in \mathbb{R}} X_\alpha?$$

Explain your reasoning and draw a sketch of the situation.