

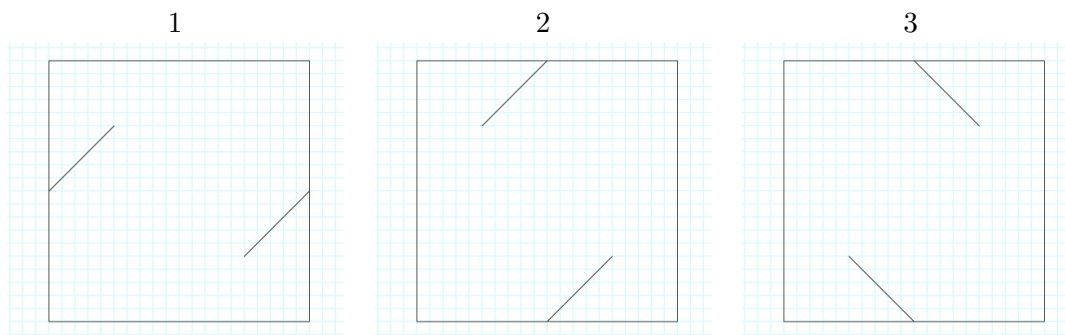
# Problem of the Month

December, 2006

Submit solutions to the office of Dr. Corey Dunn, JB 322. Be sure your name and contact information is on it. Good luck!!!

**December's Problem:** You decide to leave Earth and travel to Planet  $\mathbb{T}_2$ . When you arrive, you buy a map of their planet (the map is 1 unit by 1 unit), and begin to explore. As you track your path on your map, you discover 3 things, pictured below:

1. If your path takes you off the right side of the map at point  $(1, y)$ , then you find yourself on the left side of the map at  $(0, y)$ .
2. If your path takes you off the top of the map at point  $(x, 1)$ , then you find yourself at the bottom of the map at  $(x, 0)$ .
3. If your path takes you off the bottom of the map at point  $(x, 0)$ , then you find yourself at the top of the map at  $(x, 1)$ .



And now for December's question. Notice that if you start at the point  $(\frac{1}{4}, \frac{1}{2})$  and walk in a straight line with slope 2, then your path will eventually take you back to your starting point. The problem of this month is to determine, for any starting point  $(x_0, y_0)$ , which directions can you start walking so that your path will eventually bring you back to where you started? For extra brownie points, please tell me what the actual shape of Planet  $\mathbb{T}_2$  is (it's not a sphere).