Midterm

TMath 221

Spring 2016

NAME:

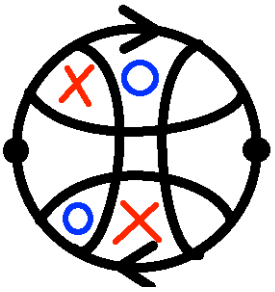
1. [3] (4/5 Class) Identify one key difference between Flatland the book and Flatland the movie. Explain why you think the movie makers made this change.

2. [3] (Weeks §1) Explain how A Square used red and blue string to motivate his fellow flatlanders into making a map of Flatland.

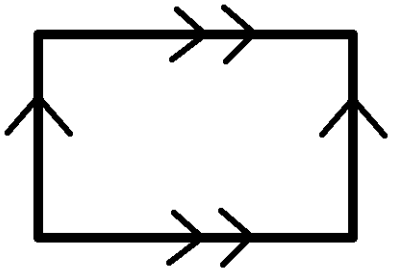
3. [4] (HW3 #4) Group the following images into sets that have the same topology.

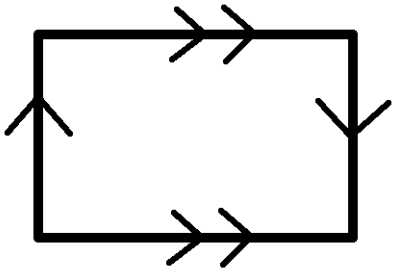
4. [2] (TED Video) Provide two non-decorative or artistic used for origami from "the real world".

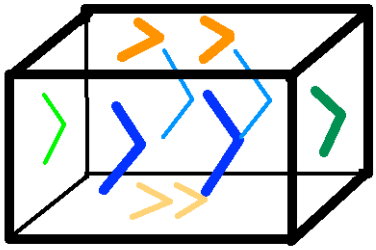
5. [3] (Weeks §3) A tic-tac-toe board being played on a projective plane is shown to the right. The game was started by X and now it is X's turn.
What is X's best move? Justify your choice.

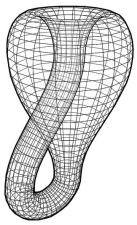


6. [6] Match the items on the left to items with the same topology on the right.

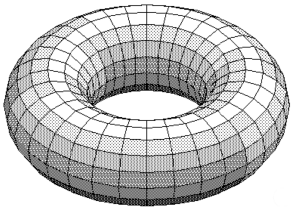






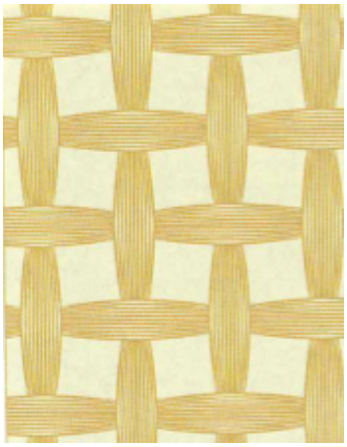


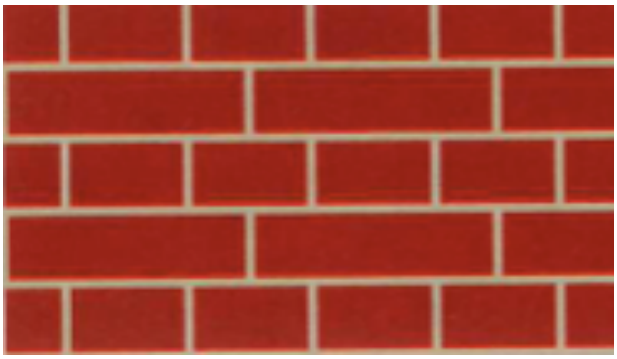
3D flat torus



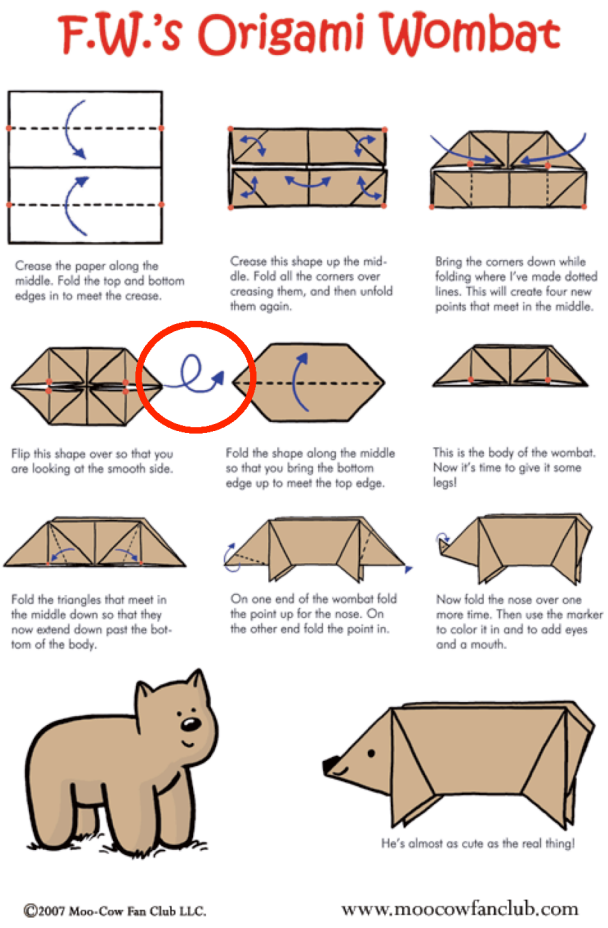
7. [3] (Weeks §3) Find a closed homogeneous 1 manifold.

8. [4] (HW2 #1) Find the signature for each of the following.





9. [2] (4/19 Class) Examine the Origami instructions to the right. What is the meaning of the circled instruction?



10. [5] (HW3 #1) Identify all possible signatures of a two dimensional tiling that includes only red symbols and the symbols *32. Be sure to explain clearly *how* you know you have found all the possibilities!

Symbol	Cost ($)	Symbol	Cost ($)
◯	2	* or ×	1
2	$\frac{1}{2}$	2	$\frac{1}{4}$
3	$\frac{2}{3}$	3	$\frac{2}{6}$ or $\frac{1}{3}$
4	$\frac{3}{4}$	4	$\frac{3}{8}$
5	$\frac{4}{5}$	5	$\frac{4}{10}$ or $\frac{2}{5}$
6	$\frac{5}{6}$	6	$\frac{5}{12}$
...	...	...	...
n	$\frac{n-1}{n}$	n	$\frac{n-1}{2n}$

NAMES:

The Largest Equilateral Triangle

inspired by Thomas Hull's "What's the biggest Equilateral Triangle in a Square" in *Project Origami, activities for exploring mathematics.*

1. [5] Find a way to fold an equilateral triangle inside a patty paper. Recall that an equilateral triangle is a triangle with all sides the same length. Explain your methods clearly and consider providing diagrams.

2. [10] Find the largest equilateral triangle that will fit on a patty paper. *Justify* that you have found the largest equilateral triangle. Hint: use the corners of the patty paper and consider symmetry!