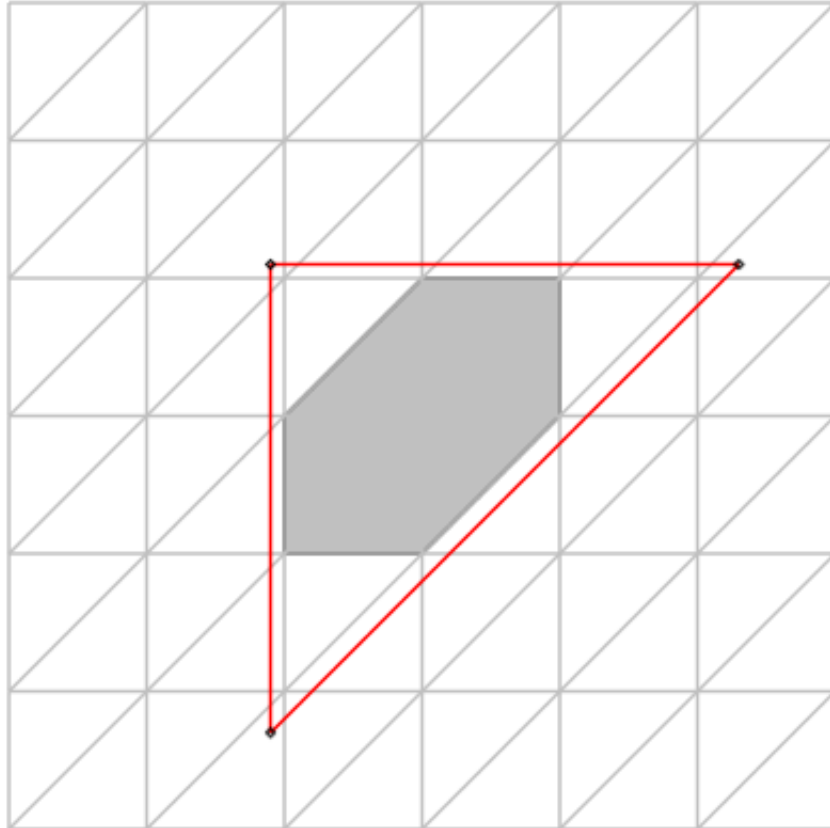


MAS435: ALGEBRAIC TOPOLOGY
2017-18
WEEKLY EXERCISES

Week 10 (Hand in to Room J26 by Thursday of Week 11)
 Consider the following picture:



(If you want extra copies at a larger scale to scribble on, you can download them from <http://shef.ac.uk/nps/courses/MAS435/sa.pdf>.)

The light grey lines show a simplicial complex $|L| \subset \mathbb{R}^2$. The shaded region in the middle does not form part of $|L|$. The triangles are filled in, so that $|L|$ is homeomorphic to an annulus. The bottom left corner is at $(-3, -3)$, and the top right corner is at $(3, 3)$. The red triangle is another simplicial complex $|K|$. This one is not filled in, so $|K|$ is homeomorphic to a circle. The picture shows a map $f: |K| \rightarrow |L|$ (sending the three vertices of K to $(-1.1, -2.3)$, $(-1.1, 1.1)$ and $(2.3, 1.1)$).

- (a) Draw $\text{star}_L^\circ(v)$ for several different vertices v of L . Choose these vertices so that the stars have different shapes.
- (b) Draw K' , and draw $\text{star}_{K'}^\circ(u)$ for some vertices u of K' .
- (c) Show that there is no simplicial approximation $s: K' \rightarrow L$.
- (d) Construct an explicit simplicial approximation $s: K^{(3)} \rightarrow L$.

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