MAS435 Quiz

Name:

1. Give the definition of a continuous map $f : X \to Y$ between topological spaces X and Y.

2. Show by drawing a picture how each of the following spaces can be obtained by identifying sides of a square.

(a) The torus

(b) The real projective plane

(c) The Klein bottle

MAS435 Quiz

Name:

1. If $\gamma_1 : [0,1] \to X$ is a path from x to y and $\gamma_2 : [0,1] \to X$ is a path from y to z in a space X, give a formula for the concatenation $\gamma_1 \cdot \gamma_2 : [0,1] \to X$. (2 points)

2. If $\vec{u}, \vec{v} \in \mathbb{R}^2$ are any vectors, give a formula for a path $\gamma : [0,1] \to \mathbb{R}^2$ from $\vec{u}$ to $\vec{v}$. (2 points)

MAS 435 Quiz

Name:

1. Define what it means for two maps $f, g : X \to Y$ to be homotopic. (2 points)

2. Let X be a space and $Y \subseteq X$ a subspace. Define what it means for a map $r : X \to Y$ to be a deformation retraction. (2 points)

MAS 4135 Quiz

Name:

Define the notion of a category. (4 points)

MAS 435 Quiz

Name:

1. If $f : X \to Y$ is continuous, define the induced map $f_* : \pi_1(X, x_0) \to \pi_1(Y, f(x_0))$: (1 point)

2. State the path lifting lemma for the covering map $p : \mathbb{R} \to S^1$, $t \mapsto e^{2\pi i t}$. (3 points)

MAS 435 Quiz

Name:

State the homotopy lifting lemma for a general covering map $p: \tilde{X} \to X$. (4 points)

MAS 435 Quiz

Name:

Write down the fundamental group of each of the following spaces. (Each is worth 1 point; you do not need to justify your answers.)

1. The sphere S^2

2. The bouquet of n circles $\bigvee_1^n S^1$

3. The torus T^2

4. Real projective space $\mathbb{RP}^n$ for $n \geq 2$