Mathematics 2200H – Mathematical Reasoning
Trent University, Fall 2022
**Optional Assignment #12**
A very finite game!
Due on Friday, 9 December.*

Please give your complete reasoning in your solution. Recall that, unless stated otherwise on a given assignment, you are permitted to work together and look things up, so long as you write up your solution by yourself and acknowledge all sources and help that you ended up using.

The game of *hexapawn* is played on a 3×3 chess board with three pawns on each side, initially set up as in the diagram below.
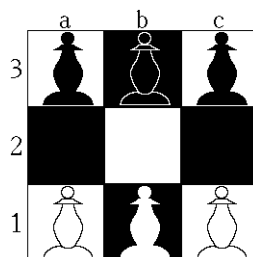
The players, White and Black, take turns moving pawns. Each may move any one pawn of their own colour on their move. Each pawn may be moved in two different ways: it may be moved one square forward, or it may capture a pawn of the other colour one square diagonally ahead of it. A pawn may not be moved forward if there is a pawn in the next square. A player loses if they have no legal moves available on their turn or if the other player reaches the end of the board with a pawn, and wins if the other player loses.

1. Show that hexapawn is a finite game, *i.e.* a game that cannot go on forever. *[5]*

2. Find a winning strategy for one player or the other. *[5]*