QUIZ 10 (MATH2301, 2025)

Name: _____

UID: _____

(1) (5 points) Select true or false

(a) A game graph cannot have an edge from an N state to an N state.

☐ True ☐ False .

(b) A game graph cannot have an edge from a P state to a P state.

☐ True ☐ False .

(c) If a state is labelled N, then the next player will win, no matter which move they make.

☐ True ☐ False .

(d) 10×10 Chomp is an N game.

☐ True ☐ False .

(e) If G is an N game, then $G + G$ is a P game.

☐ True ☐ False .

(2) (5 points) Remember the rules of Grundy's game: we start with piles of stones and a move consists of dividing a pile in two non-empty piles of unequal sizes. Draw the game graph of Grundy's game starting with two piles of size 3 and 4. Label each node as N or P.

1. Solutions

(1) True or false
   (a) False.
   (b) True.
   (c) False.
   (d) True.
   (e) True.

(2) The game graph has the following edges

$$(3,4) \to (1,2,4) \text{ and } (3,1,3)$$
$$(1,2,4) \to (1,2,1,3)$$
$$(3,1,3) \to (1,2,1,3)$$
$$(1,2,1,3) \to (1,2,1,1,2).$$

This means $(1,2,1,1,2)$ is P; $(1,2,1,3)$ is N; both $(1,2,4)$ and $(3,1,3)$ are P; and $(3,4)$ is N.