ECO316: Applied Game Theory

Midterm Exam

Fall 2025

Please answer all questions below in the answer booklets. Where you are asked to 'show' or 'prove' a claim, please provide a formal (mathematical) argument for your answer; if you are asked to 'argue' or 'discuss' a claim, a verbal argument will suffice.

1. **Competing for a Promotion:** Two workers are competing for a promotion. Both workers individually decide how much effort, $e \in [0, 1]$ to put into their work. If one worker chooses strictly more effort than the other, that worker receives a promotion with 100% probability and the other worker does not receive a promotion. If both put the same effort into their work, each receives the promotion with 50% probability. Assume the payoff to receiving a promotion is 1 and not is 0.

   (a) Show that both workers choosing $e = 1$ is the unique Nash Equilibrium in pure strategies (i.e., show that this is an equilibrium and any other pairs of effort are not an equilibrium) (6 points)