

## VI. International Conference on Mathematics and its Applications in Science and Engineering [ICMASE 2025]

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### Title: Study of Market Equilibrium in Oligopoly Markets Using Response Functions

**Abstract:** We present the theory of studying market equilibrium in oligopoly markets using a response function instead of maximizing the payoff functions of market participants. The considered technique is based on generalized coupled, tripled, and  $n$ -tuples of fixed points. The notion for a generalized type of the mentioned above fixed points naturally arises in the investigation of market equilibrium in an oligopoly market because the classical coupled and tripled are not suitable. We give the relationship between the two models, the one based on payoff maximization and the one using response functions. We get theoretical results that give sufficient conditions for the existence of market equilibrium. We obtain necessary and sufficient conditions under which, if the response function model is obtained by maximizing payoff, then the two models are equivalent. We illustrate the results obtained with markets of different types: duopoly markets and markets with three producers (tripodal markets); markets where competition is on just one good and markets where participants compete on many goods; markets that include the Cournot-Bertrand model, i.e., competition on quantities and prices simultaneously; and markets in which payoff functions are not differentiable and it is not naturally possible to apply payoff maximization techniques. We present models generated from real data and investigate the equilibrium and its stability using the developed theory of response functions.