

17. Anthony spends his income on fishing lures ( $L$ ) and guitar picks ( $G$ ). Lures are priced at \$2, while a package of guitar picks costs \$1. Assume that Anthony has \$30 to spend and his utility function can be represented as  $U(L,G) = L^{0.5}G^{0.5}$ . For this utility function,  $MU_L = 0.5L^{-0.5}G^{0.5}$  and  $MU_G = 0.5L^{0.5}G^{-0.5}$ .
- What is the optimal number of lures and guitar picks for Anthony to purchase? How much utility does this combination bring him?
  - If the price of guitar picks doubles to \$2, how much income must Anthony have to maintain the same level of utility?
  - Given the utility function in this problem, show that the marginal utilities are as given using calculus.
  - Suppose that the prices of lures and guitar picks are \$2 and \$1 (as they were before the price change) and that Anthony still has only \$30 to spend. Use a Lagrangian to solve his constrained utility-maximization problem and confirm that the answer is the same as that to part (a).
  - Now suppose that the prices of lures and guitar picks are \$2 and \$2 (as they were after the price change). Assuming Anthony wants to maintain the same level of utility as he did before the price change with the lowest possible expenditure,
    - Write a statement of Anthony's constrained optimization problem.
    - Use a Lagrangian to solve Anthony's expenditure-minimization problem and confirm that the answer is the same as that to part (b).
  - Again suppose that the prices of lures and guitar picks are \$2 and \$2 (as they were after the price change). This time, however, assume that Anthony still has only \$30 to spend. Use a Lagrangian to solve his constrained utility-maximization problem.