

17. A young college student on a tight budget is campaigning for an open city council seat. A friend in her economics class estimates that voters are influenced by TV and newspaper ads according to the following function:  $\text{Votes} = 300TV^{0.6}NP^{0.2}$ , where  $TV$  represents the number of television ads and  $NP$  represents the number of newspaper ads. Thus, the marginal product of a newspaper ad is  $60TV^{0.6}NP^{-0.8}$  and the marginal product of a TV ad is  $180TV^{-0.4}NP^{0.2}$ . A local television ad costs \$400, and a local newspaper ad costs \$250.
- If the candidate needs 1,800 votes to win, what is the lowest-cost combination of newspaper and TV ads that will bring her victory?
  - Given the production function in this problem, show that the marginal products are as given using calculus.
  - Use a Lagrangian to re-solve the constrained cost-minimization problem in part (a) for the college student.
  - What is the student's long-run expansion path?