

7. The platypus is a shy and secretive animal that does not breed well in captivity. But two breeders, Sydney and Adelaide, have discovered the secret to platypus fertility and have effectively cornered the market. Zoos across the globe come to them to purchase their output; the world inverse demand for baby platypuses is given by  $P = 1,000 - 2Q$ , where  $Q$  is the combined output of Sydney ( $q_S$ ) and Adelaide ( $q_A$ ).
- Sydney wishes to produce the profit-maximizing quantity of baby platypus. Given Adelaide's choice of output,  $q_A$ , write an equation for the residual demand faced by Sydney.
  - Derive Sydney's residual marginal revenue curve.
  - Assume that the marginal and average total cost of raising a baby platypus to an age at which it can be sold is \$200. Derive Sydney's reaction function.
  - Repeat steps (a), (b), and (c) to find Adelaide's reaction function to Sydney's output choice.
  - Solve for Sydney's profit-maximizing level of output and Adelaide's profit-maximizing level of output.
  - Determine industry output, the price of platypus, and the profits of both Sydney and Adelaide.
  - If Adelaide were hit by a bus on her way home from work, and Sydney were to become a monopolist, what would happen to industry quantity, price, and profit?
  - Re-solve for the Cournot and monopoly equilibria using calculus methods this time and confirm that your answers are the same as those solved algebraically in parts (e)–(g).