

ECON 4561  
Applied Computational Economics  
Homework 4  
Due Saturday, July 11, 2009

1. As a social planner, you wish to maximize the discounted sum of net social surplus from harvesting a renewable resource over an infinite horizon. Let  $s_t$  denote the amount of resource available at the beginning of year  $t$  and let  $x_t$  denote the amount harvested. The harvest cost is  $c(x_t) = kx_t$ , the market clearing price is  $p_t = x_t^{-\gamma}$ , and the stock dynamic is  $s_{t+1} = \alpha(s_t - x_t) - 0.5\beta(s_t - x_t)^2$ . Assume  $\gamma = 0.5$ ,  $\alpha = 4$ ,  $\beta = 1.0$ ,  $k = 0.2$ , and  $\delta = 0.9$ .
  - (a) Solve the model using Chebychev collocation on the interval  $[4, 8]$ .
  - (b) Plot the optimal harvest policy.
  - (c) Plot the shadow price function.
  - (d) Plot the residual function.
  - (e) Plot the resource level over a twenty year horizon beginning from a level of  $s = 4$ .