

## Homework 4

**Problem 1** Nadia likes spare ribs,  $R$ , and fried chicken,  $C$ . Her utility function is

$$U = 10R^2C \quad (1)$$

Her marginal utilities are  $MU_R = 20RC$  and  $MU_C = 10R^2$ . Her weekly income is \$90, which she spends on only ribs and chicken.

- a. If she pays \$10 for a slab of ribs and \$5 for a chicken, what is her optimal consumption bundle? Show her budget line, indifference curve, and optimal bundle,  $e_1$  in a diagram.
- b. Suppose the price of a chicken doubles to \$10. How does her optimal consumption of chicken and ribs change? Show her new budget line and optimal bundle,  $e_2$ , in your diagram.
- c. Solve for Nadia's demand for chicken when the price of a chicken is  $p_c$ , for any  $p_c$ .

**Problem 2** The cost function for John's shoe repair is  $c(q) = 100 + 10q - q^2 + \frac{1}{3}q^3$ , so that marginal cost is  $c'(q) = 10 - 2q + q^2$ . Shoe repair is a perfectly competitive industry.

- a. Suppose the price of shoes is \$80. Solve for John's profit-maximizing quantity of shoes repaired. What is John's profit in this case?
- b. What is John's supply curve, relating the price of a shoe repair  $p$  to the quantity of shoes he repairs,  $q$ ?
- c. Draw a picture of John's average cost curve (hint: average cost is  $\frac{c(q)}{q} = \frac{100}{q} + 10 - q + \frac{1}{3}q^2$ ) and his marginal cost curve. Indicate where in your picture John's supply curve is. Also indicate the price below which John would shut down his business in the long run.

**Problem 3** Each firm in a competitive market has a cost function of  $c(q) = 16 + q^2$ . The market demand function is  $Q = 24 - p$ . Determine the long-run equilibrium price, quantity per firm, market quantity, and number of firms.

**Problem 4** What are the welfare effects of a binding minimum wage? Use a graphical approach to show what happens if all workers are identical. Then verbally describe what is likely to happen to workers who differ by experience, education, age, gender, and race.

**Problem 5** If the demand curve for books is  $p = 60 - Q$ , and the supply curve is  $p = Q$ , what are the welfare effects of a tax on buyers of \$2? Make sure to give consumer and producer surplus before and after the tax, as well as the deadweight loss and government revenue resulting from the tax.

**Problem 6** Suppose demand for wheat is  $Q = 100 - 10p$  and supply is  $Q = 10p$ . The government imposes a price ceiling of  $p = 3$

- a. Describe how the equilibrium changes.
- b. What effect does this ceiling have on consumer surplus, producer surplus, and deadweight loss?

**Problem 7** A government is considering implementing either a quota or a tariff, each of which would reduce imports by the same amount. Which does the government prefer, and why?