12.7

The perfectly competitive videotape-copying industry is composed of many firms that can copy five tapes per day at an average cost of \$10 per tape. Each firm must also pay a royalty to film studios, and the per-film royalty rate (r) is an increasing function of total industry output (Q):

$$r = 0.002Q.$$

Demand is given by

$$Q = 1{,}050 - 50P.$$

a. Assuming the industry is in long-run equilibrium, what will be the equilibrium price and quantity of copied tapes? How many tape firms will there be? What will the per-film royalty rate be?
b. Suppose that demand for copied tapes increases to

$$Q = 1{,}600 - 50P.$$

In this case, what is the long-run equilibrium price and quantity for copied tapes? How many tape firms are there? What is the per-film royalty rate?
c. Graph these long-run equilibria in the tape market, and calculate the increase in producer surplus between the situations described in parts (a) and (b).
d. Show that the increase in producer surplus is precisely equal to the increase in royalties paid as Q expands incrementally from its level in part (b) to its level in part (c).
e. Suppose that the government institutes a \$5.50 per-film tax on the film-copying industry. Assuming that the demand for copied films is that given in part (a), how will this tax affect the market equilibrium?
f. How will the burden of this tax be allocated between consumers and producers? What will be the loss of consumer and producer surplus?
g. Show that the loss of producer surplus as a result of this tax is borne completely by the film studios. Explain your result intuitively.

12.8

The domestic demand for portable radios is given by

$$Q = 5{,}000 - 100P,$$

where price (P) is measured in dollars and quantity (Q) is measured in thousands of radios per year. The domestic supply curve for radios is given by

$$Q = 150P.$$

a. What is the domestic equilibrium in the portable radio market?
b. Suppose portable radios can be imported at a world price of \$10 per radio. If trade were unencumbered, what would the new market equilibrium be? How many portable radios would be imported?
c. If domestic portable radio producers succeeded in having a \$5 tariff implemented, how would this change the market equilibrium? How much would be collected in tariff revenues? How much consumer surplus would be transferred to domestic producers? What would the deadweight loss from the tariff be?
d. How would your results from part (c) be changed if the government reached an agreement with foreign suppliers to "voluntarily" limit the portable radios they export to 1,250,000 per year? Explain how this differs from the case of a tariff.

13.1

Suppose the production possibility frontier for guns (x) and butter (y) is given by

$$x^2 + 2y^2 = 900.$$

a. Graph this frontier.
b. If individuals always prefer consumption bundles in which $y = 2x$, how much x and y will be produced?
c. At the point described in part (b), what will be the RPT and hence what price ratio will cause production to take place at that point? (This slope should be approximated by considering small changes in x and y around the optimal point.)
d. Show your solution on the figure from part (a).

13.2

Suppose two individuals (Smith and Jones) each have 10 hours of labor to devote to producing either ice cream (x) or chicken soup (y). Smith's utility function is given by

$$U_S = x^{0.3}y^{0.7},$$

whereas Jones' is given by

$$U_J = x^{0.5}y^{0.5}.$$

The individuals do not care whether they produce x or y, and the production function for each good is given by

$$x = 2l \quad \text{and} \quad y = 3l,$$

where l is the total labor devoted to production of each good.

a. What must the price ratio, p_x/p_y, be?
b. Given this price ratio, how much x and y will Smith and Jones demand? *Hint:* Set the wage equal to 1 here.
c. How should labor be allocated between x and y to satisfy the demand calculated in part (b)?

13.5

Smith and Jones are stranded on a desert island. Each has in his possession some slices of ham (H) and cheese (C). Smith is a choosy eater and will eat ham and cheese only in the fixed proportions of 2 slices of cheese to 1 slice of ham. His utility function is given by $U_S = \min(H, C/2)$.

Jones is more flexible in his dietary tastes and has a utility function given by $U_J = 4H + 3C$. Total endowments are 100 slices of ham and 200 slices of cheese.

a. Draw the Edgeworth box diagram that represents the possibilities for exchange in this situation. What is the only exchange ratio that can prevail in any equilibrium?
b. Suppose Smith initially had 40H and 80C. What would the equilibrium position be?
c. Suppose Smith initially had 60H and 80C. What would the equilibrium position be?
d. Suppose Smith (much the stronger of the two) decides not to play by the rules of the game. Then what could the final equilibrium position be?

13.6

In the country of Ruritania there are two regions, A and B. Two goods (x and y) are produced in both regions. Production functions for region A are given by

$$x_A = \sqrt{l_x},$$
$$y_A = \sqrt{l_y};$$

here l_x and l_y are the quantities of labor devoted to x and y production, respectively. Total labor available in region A is 100 units; that is,

$$l_x + l_y = 100.$$

Using a similar notation for region B, production functions are given by

$$x_B = \frac{1}{2}\sqrt{l_x},$$
$$y_B = \frac{1}{2}\sqrt{l_y}.$$

There are also 100 units of labor available in region B:

$$l_x + l_y = 100.$$

a. Calculate the production possibility curves for regions A and B.
b. What condition must hold if production in Ruritania is to be allocated efficiently between regions A and B (assuming labor cannot move from one region to the other)?
c. Calculate the production possibility curve for Ruritania (again assuming labor is immobile between regions). How much total y can Ruritania produce if total x output is 12? *Hint:* A graphical analysis may be of some help here.