PROBLEM SET 9 – Tutorial Week 12 (October 31–November 3)

Deadline: 11:59 p.m. two days before your tutorial. Please submit a PDF in groups of 2–3 within your tutorial group. On the first page, write your full names (as on the roster) in alphabetical order. Start each question on a new page. Name your PDF "PSet # – LastName LastName LastName," e.g., "PSet 9 – Banerjee Duflo Kremer." Points will be deducted for not adhering to the instructions.

QUESTION 1

A competitive firm has the following short-run cost function: $SRTC(Q) = Q^3 - 8Q^2 + 30Q + 5$. All of the fixed cost is sunk.

(a) Find the short-run marginal cost curve, the short-run average total cost curve, and the average variable cost curve. Draw these curves using Excel.

(b) At what range of prices will the firm supply zero output?

(c) Identify the firm's supply curve on your graph in (a).

(d) At what price will the firm supply exactly 6 units of output?

(e) Suppose all firms in the market are identical. The market demand curve is $D(p) = 180 - 4p$. The current short-run equilibrium price is 25. How many firms are there in the market?

QUESTION 2

There are currently 10 identical firms in a perfectly competitive manufacturing industry. Each firm operates in the short run with a fixed cost of F and a variable cost of $2Q^2$. When the market price is 40, each firm produces a positive amount of output and earns zero economic profit. The market demand is $Q = 180 - \frac{5}{2}p$.

Note: When there are 10 *identical firms in the market, the short-run equilibrium price is not necessarily* 40.

(a) Find the individual firm's fixed cost, F.

(b) From now on, suppose 25% of the fixed cost is non-sunk. Derive the equation of the short-run supply curve for an individual firm.

(c) What is the short-run equilibrium price when there are 10 firms in the market? Find the individual firm's profit in the short-run equilibrium.

(d) Consider a short-run equilibrium where every firm's profit is zero. How many firms would there be in the market?

QUESTION 3

The industry for cobalt mining is perfectly competitive. A typical mine has a capacity constraint of 200 tons (i.e., it cannot produce more than 200 tons) and a constant marginal cost of 400. All of the fixed cost is sunk. Currently there are 60 identical mines in the industry. The current market demand for cobalt is $D(p) = 20{,}000 - 10p$.

(a) Find the supply curve of a representative mine. Draw the supply curve. Plot the critical points.

(b) Find the short-run equilibrium price and quantity of cobalt.

QUESTION 4

A competitive industry consists of 6 type A firms and 4 type B firms. Each type A firm operates with the supply curve:

$$Q_A = \begin{cases} p - 10, & p \geq 10 \\ 0, & p < 10 \end{cases}$$

Each type B firm operates with the supply curve:

$$Q_B = 2p, \quad p \geq 0$$

(a) Find the market supply curve. Draw the market supply curve. Plot the critical points.

(b) Suppose the market demand is $D(p) = 108 - 10p$. At the market equilibrium, which firms are producing output? What is the equilibrium price?