**Problem Set # 10: IDs 2500 - 3749**

**Costs of Production & Short-run Production Decisions**

Answer the questions below. Then log on to the course web site (http://faculty.tcu.edu/jlovett), go to Microeconomics, then Problem Sets, then **PS 10**. Fill out the on-line answer form.

*** Your grade is based on your on-line answers. ***

1. What time period are we dealing with in these charts?

2. What determined the answer to the previous question (# 1)? i.e. What was the definitive piece of evidence that allowed you to determine the time period?

3. What type of market is this firm in?

4. What determined the answer the previous question (# 3)? i.e. What was the definitive piece of evidence that allowed you to determine the type of market the firm is in?

5. What is the **production rule** for a **perfectly competitive firm**?

6. What is the **short-run shutdown rule** for a **perfectly competitive firm**?

7. What is the **long-run exit rule** for a **perfectly competitive firm**?

8. What is the **production rule** for a **monopolist**?

9. What is the **short-run shutdown rule** for a **monopolist**?

10. What is the **long-run exit rule** for a **monopolist**?

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1 Note: There are 2 ways to MC, 1) in between the quantities or 2) in line with the quantity with which the change ends (the way the text does). Graphing MC in between the quantities is best for illustrating the relationships between the curves (ex. MC hits AVC at AVC_{Min}). Graphing MC in line with the quantity with which the change ends (the way the text does) is the best way to precisely determine the optimal level of output.
Answer questions # 11 – 18 based the High Demand situation.

11. Production Rule. Start from the output at which MC is at its lowest. i.e. Do not consider the range over which MC is falling. What level of output should the firm produce if it decides to produce over this range?

12. At the above level of output, is the firm covering its variable costs?

13. At the above level of output, is the firm covering its total costs?

14. At the above level of output, is the firm earning (economic) profits?

15. Short-run Shut-down Rule. Assume the firm must choose between: 1) producing at the level you chose in question # 11, or 2) temporarily closing done. We are not considering going out of business here, just whether or not to temporarily shut the gravel pit down. What should the firm do?

16. Long-Run Exit Rule. Assume the level of demand (highest) your costs are not going to change. i.e. the conditions you are experiencing can be expected to continue into the long-run. What should your firm do?

17. Fill in the profits columns for the Highest Demand situation. Do the production, shut-down, and leave the business rules serve to maximize the firm’s profits or minimize its losses?

18. Assume there are no externalities involved in the production or consumption of this good. If the firm produces its profit maximizing amount, is it also producing the socially optimal (socially efficient) amount?

Answer questions # 19 – 26 based the Medium Demand situation.

19. Production Rule. Start from the output at which MC is at its lowest. i.e. Do not consider the range over which MC is falling. What level of output should the firm produce if it decides to produce over this range?

20. At the above level of output, is the firm covering its variable costs?

21. At the above level of output, is the firm covering its total costs?

22. At the above level of output, is the firm earning (economic) profits?

23. Short-run Shut-down Rule. Assume the firm must choose between: 1) producing at the level you chose in question # 19, or 2) temporarily closing done. We are not considering going out of business here, just whether or not to temporarily shut the gravel pit down. What should the firm do?
24. **Long-Run Exit Rule.** Assume the level of demand (medium) your costs are not going to change. i.e. the conditions you are experiencing can be expected to continue into the long-run. What should your firm do?

25. Fill in the profits columns for the Medium Demand situation. Do the production, shut-down, and leave the business rules serve to maximize the firm’s profits or minimize its losses?

26. Assume there are no externalities involved in the production or consumption of this good. If the firm produces its profit maximizing amount, is it also producing the socially optimal (socially efficient) amount?

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**Answer questions # 27 – 34 based the LOW Demand situation.**

27. **Production Rule.** Start from the output at which MC is at its lowest. i.e. Do not consider the range over which MC is falling. What level of output should the firm produce if it decides to produce over this range?

28. At the above level of output, is the firm covering its variable costs?

29. At the above level of output, is the firm covering its total costs?

30. At the above level of output, is the firm earning (economic) profits?

31. **Short-run Shut-down Rule.** Assume the firm must choose between: 1) producing at the level you chose in question # 27, or 2) temporarily closing done. We are not considering going out of business here, just whether or not to temporarily shut the gravel pit down. What should the firm do?

32. **Long-Run Exit Rule.** Assume the level of demand (low) your costs are not going to change. i.e. the conditions you are experiencing can be expected to continue into the long-run. What should your firm do?

33. Fill in the profits columns for the Low Demand situation. Do the production, shut-down, and leave the business rules serve to maximize the firm’s profits or minimize its losses?

34. Assume there are no externalities involved in the production or consumption of this good. If the firm produces its profit maximizing amount, is it also producing the socially optimal (socially efficient) amount?
## High Demand

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### Graph

- **Axes:**
  - X-axis: q (tons)
  - Y-axis: $\pi$

- **Points:**
  - q = 0, $\pi$ = $2,500$
  - q = 20, $\pi$ = $70.25$
  - q = 40, $\pi$ = $67.75$
  - q = 60, $\pi$ = $65.25$
  - q = 80, $\pi$ = $62.75$
  - q = 100, $\pi$ = $60.25$
  - q = 120, $\pi$ = $57.75$
  - q = 140, $\pi$ = $55.25$
## Medium Demand

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![Graph showing medium demand and price]
## Low Demand

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### Graph

- **Axes:**
  - **x-axis:** q (tons)
  - **y-axis:** $ (dollars)

- **Lines:**
  - $5, $10, $15, $20, $25, $30, $35, $40, $45, $50, $55, $60

- **Grid:**
  - Intersections of q (tons) and $ values

- **Points:**
  - Represent the total cost (TC) at different levels of output (q) for the given price (P).

- **Legend:**
  - TFC (Total Fixed Cost)
  - TVC (Total Variable Cost)
  - TC (Total Cost)
  - MC (Marginal Cost)
  - AFC (Average Fixed Cost)
  - AVC (Average Variable Cost)
  - ATC (Average Total Cost)
  - TR (Total Revenue)
  - MR (Marginal Revenue)
  - π (Profit)

- **Profit Calculation:**
  - Profit (π) = TR - TC
  - π = $30.25 at 140 tons
  - π = -$1,895 at 20 tons
  - π = -$1,290 at 40 tons
  - π = -$885 at 60 tons
  - π = -$680 at 80 tons
  - π = -$1,020 at 100 tons
  - π = -$1,615 at 120 tons
  - π = -$2,500 at 140 tons

- **Marginal Analysis:**
  - MR decreases as q increases.
  - MR intersects with MC at 140 tons, indicating optimal output for profit maximization.

- **Total Cost Analysis:**
  - TC increases as q increases.
  - TC intersects with TR at 140 tons, indicating the break-even point.

- **Profit Maximization:**
  - Optimal output for maximizing profit is 140 tons, where π = $30.25.