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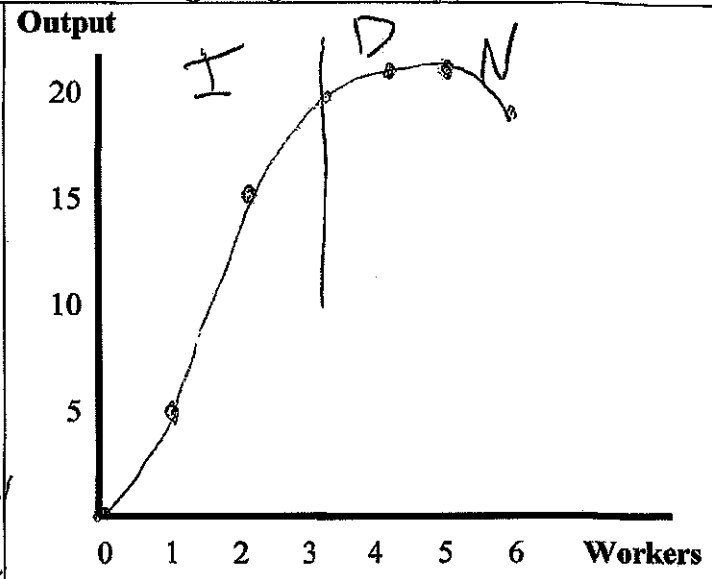
Unit 3: Costs of Production and Perfect Competition

Production and the Law of Diminishing Marginal Returns

Calculate MP. Plot TP and MP on Graph

Number of Workers	Total Product	Marginal Product
0	0	–
1	5	5
2	15	10
3	19	4
4	20	1
5	20	0
6	18	-2



Define the Law of Diminishing Marginal Returns. As variable resources are added to fixed resources the additional output produced from each additional worker will eventually fall.

After which worker does diminishing marginal returns set in? (2)

Identify the three stages of returns: increasing, decreasing, and negative marginal returns

Revenue and Costs (Define the following)

Total Revenue- How much a firm brings in

Accounting Profit- look only @ explicit costs

Economic Profit- Explicit and implicit costs

Normal Profit- No economic profit

Fixed Cost (FC)- Costs for resources that don't change

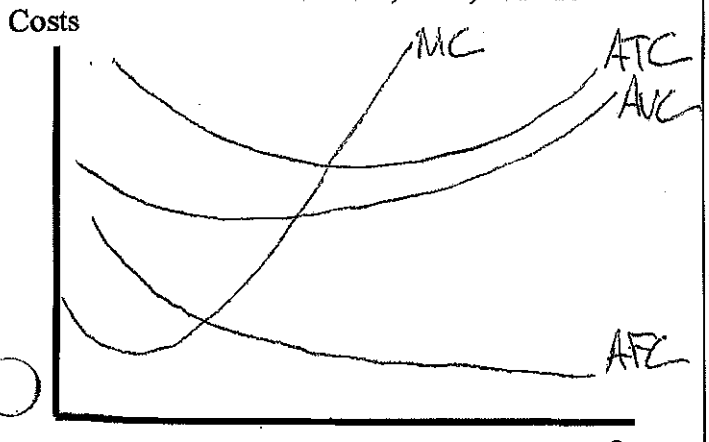
Variable Cost (VC)- costs for variable resources that do change with amount produced

Total Cost (TC)- sum of fixed and variable costs

Marginal Cost (MC)- additional costs of an additional output

Short Run Cost Curves (at least one fixed resource)

Draw and Label ATC, AVC, and MC



Long-Run Cost Curves (all resources are variable)

Economies of Scale- long run average costs fall because of mass production

Diseconomies of Scale- long run average costs increase as the firm gets too big and difficult to manage.

Profit Maximizing MR=MC

Name: _____

Calculating ATC, AVC, AFC, and MC

Fill in the blanks for a firm producing boxes of oranges :

Output (box)	Variable Cost	Total Cost	AVC	AFC	ATC	MC
0	$0	$10	-	-	-	-
1	20	30	20	10	30	20
2	30	40	15	5	20	10
3	60	70	20	3.33	23.3	30
4	100	110	25	2.5	27.5	40

Assume this firm is in a perfectly competitive market and the price is $35 for each box.

1. How many boxes should they produce? Why? 3. MR=MC
   $35 = 30
2. Calculate the profit at that quantity
   $35 x 3 = 105 − 70 = $35

Shut Down Point

Shut Down Rule: Firm should produce ~~until~~ as long as price is above AVC

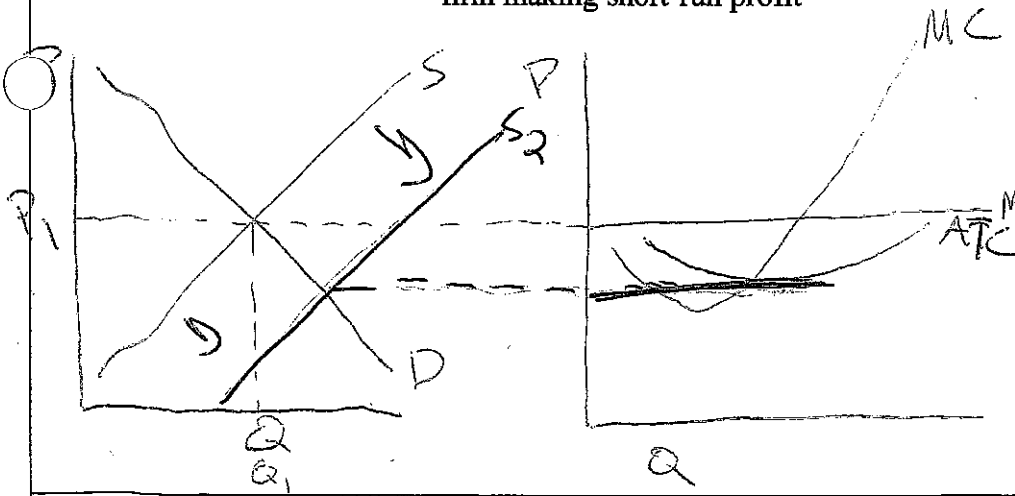
Short–Run Supply Curve: MC above AVC

Per-Unit vs. Lump-Sum

1. A per unit tax shifts VC, MC, AVC, ATC so quantity will be effected.
2. A lump sum tax shifts Fixed Costs so quantity will not be effected.

Graphing Perfect Competition

Draw side-by-side graphs showing a perfectly competitive market and firm. Draw the firm making short-run profit



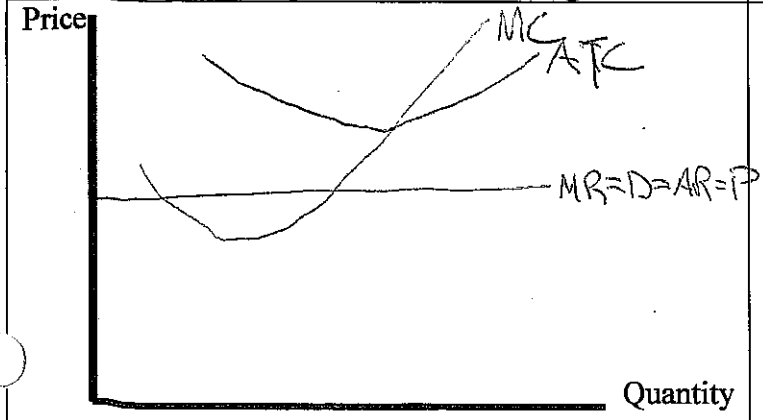
List (in order) what will happen in the long-run

1. Firms choose profit
2. Supply will ↑
3. Put the firm in long run

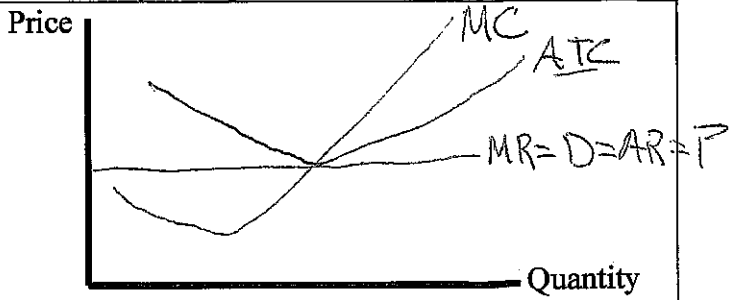
Market P↓ Q↑

Firm P↓ Q↓

Perfectly Competitive Firm Making a Loss



Perfectly Competitive Firm in Long-Run



This firm has both type of efficiency:

1. Allocative
2. Productive

Solutions appear at the back of the book.

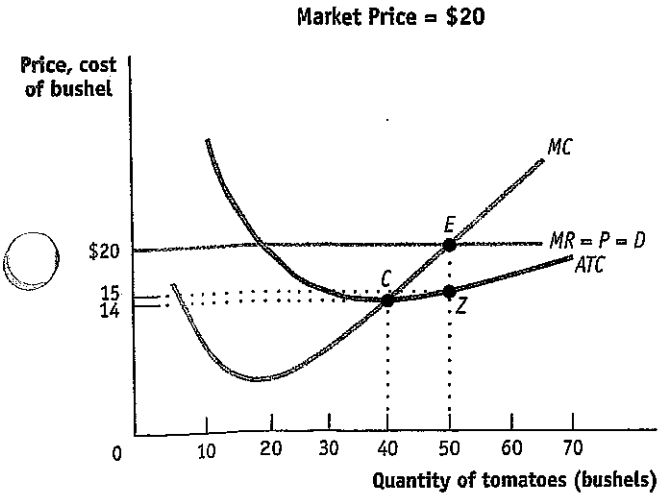
Check Your Understanding

1. Draw a short-run diagram showing a U-shaped average total cost curve, a U-shaped average variable cost curve, and a "swoosh"-shaped marginal cost curve. On it, indicate the range of prices for which the following actions are optimal.
   a. The firm shuts down immediately.
   b. The firm operates in the short run despite sustaining a loss.
   c. The firm operates while making a profit.

2. The state of Maine has a very active lobster industry, which harvests lobsters during the summer months. During the rest of the year, lobsters can be obtained by restaurants from producers in other parts of the world, but at a much higher price. Maine is also full of "lobster shacks," roadside restaurants serving lobster dishes that are open only during the summer. Supposing that the market demand for lobster dishes remains the same throughout the year, explain why it is optimal for lobster shacks to operate only during the summer.

Tackle the Test: Multiple-Choice Questions

For questions 1-3, refer to the graph provided.



1. The firm's total revenue is equal to
   a. $14.
   b. $20.
   c. $560.
   d. $750.
   e. $1,000.

2. The firm's total cost is equal to
   a. $14.
   b. $15.
   c. $560.
   d. $750.
   e. $1,000.

3. The firm is earning a
   a. profit equal to $5.
   b. profit equal to $250.
   c. loss equal to $15.
   d. loss equal to $750.
   e. loss equal to $250.

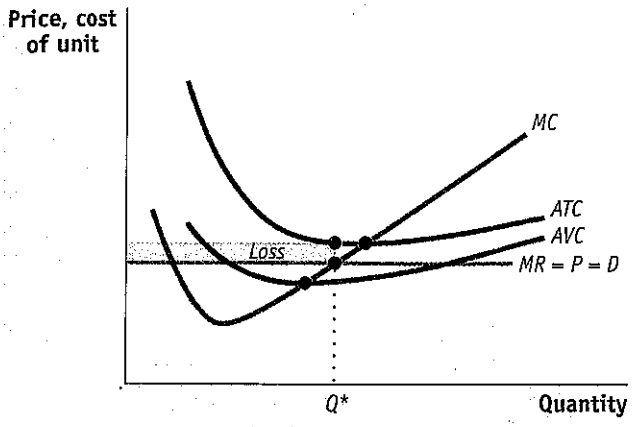
4. A firm should continue to produce in the short run as long as price is at least equal to
   a. *MR*.
   b. *MC*.
   c. minimum *ATC*.
   d. minimum *AVC*.
   e. *AFC*.

5. At prices that motivate the firm to produce at all, the short-run supply curve for a perfect competitor corresponds to which curve?
   a. the *ATC* curve
   b. the *AVC* curve
   c. the *MC* curve
   d. the *AFC* curve
   e. the *MR* curve

Tackle the Test: Free-Response Questions

Draw a correctly labeled graph showing a perfectly competitive firm producing and incurring a loss in the short run.

Answer (10 points)



1 point: Vertical axis is labeled "Price, cost of unit" or "Dollars per unit"; horizontal axis labeled "Quantity" or "Q."

1 point: Demand curve is horizontal and labeled with some combination of *"P," "MR,"* or *"D."*

1 point: *MC* is labeled and slopes upward in the shape of a swoosh.

1 point: Profit-maximizing quantity is labeled (for example, as "Q^*") on the horizontal axis where $MC = MR$.

1 point: *ATC* is labeled and U-shaped.

1 point: *ATC* is above price at the profit-maximizing output.

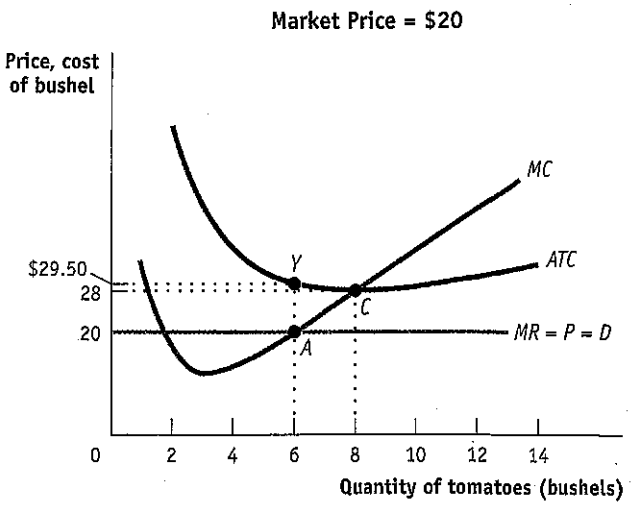
1 point: *MC* crosses *ATC* at the lowest point on *ATC*.

1 point: *AVC* is labeled and U-shaped.

1 point: *AVC* is below price at the profit-maximizing output.

1 point: Loss rectangle is correctly located and identified.

2. Refer to the graph provided.



a. Assuming it is appropriate for the firm to produce in the short run, what is the firm's profit-maximizing level of output? 6

b. Calculate the firm's total revenue. $120

c. Calculate the firm's total cost. $177

d. Calculate the firm's profit or loss. −57

e. If *AVC* were $22 at the profit-maximizing level of output, would the firm produce in the short run? Explain why or why not. NO P < AVC

Solutions appear at the back of the book.

Check Your Understanding

1. Which of the following events will induce firms to enter an industry? Which will induce firms to exit? When will entry or exit cease? Explain your answer.
   a. A technological advance lowers the fixed cost of production of every firm in the industry.
   b. The wages paid to workers in the industry go up for an extended period of time.
   c. A permanent change in consumer tastes increases demand for the good.
   d. The price of a key input rises due to a long-term shortage of that input.
2. Assume that the egg industry is perfectly competitive and is in long-run equilibrium with a perfectly elastic long-run industry supply curve. Health concerns about cholesterol then lead to a decrease in demand. Construct a figure similar to Figure 24.3, showing the short-run behavior of the industry and how long-run equilibrium is reestablished.

Tackle the Test: Multiple-Choice Questions

1. In the long run, a perfectly competitive firm will earn
   a. a negative market return.
   b. a positive profit.
   c. a loss.
   d. a normal profit.
   e. excess profit.
2. With perfect competition, efficiency is generally attained in
   a. the short run but not the long run.
   b. the long run but not the short run.
   c. both the short run and the long run.
   d. neither the short run nor the long run.
   e. specific firms only.
3. Compared to the short-run industry supply curve, the long-run industry supply curve will be more
   a. elastic.
   b. inelastic.
   c. steeply sloped.
   d. profitable.
   e. accurate.
4. Which of the following is generally true for perfect competition?
   I. There is free entry and exit.
   II. Long-run market equilibrium is efficient.
   III. Firms maximize profits at the output level where $P = MC$.
   a. I only
   b. II only
   c. III only
   d. I and II only
   e. I, II, and III
5. Which of the following will happen in response if perfectly competitive firms are earning positive economic profit?
   a. Firms will exit the industry.
   b. The short-run industry supply curve will shift right.
   c. The short-run industry supply curve will shift left.
   d. Firm output will increase.
   e. Market price will increase.

Tackle the Test: Free-Response Questions

1. Draw a correctly labeled graph showing a perfectly competitive firm in long-run equilibrium.

Answer (7 points)

1 point: Axes are correctly labeled.

1 point: Demand curve is horizontal and labeled with some combination of "*P*," "*MR*," or "*D*."

1 point: Marginal cost curve is labeled and slopes upward.

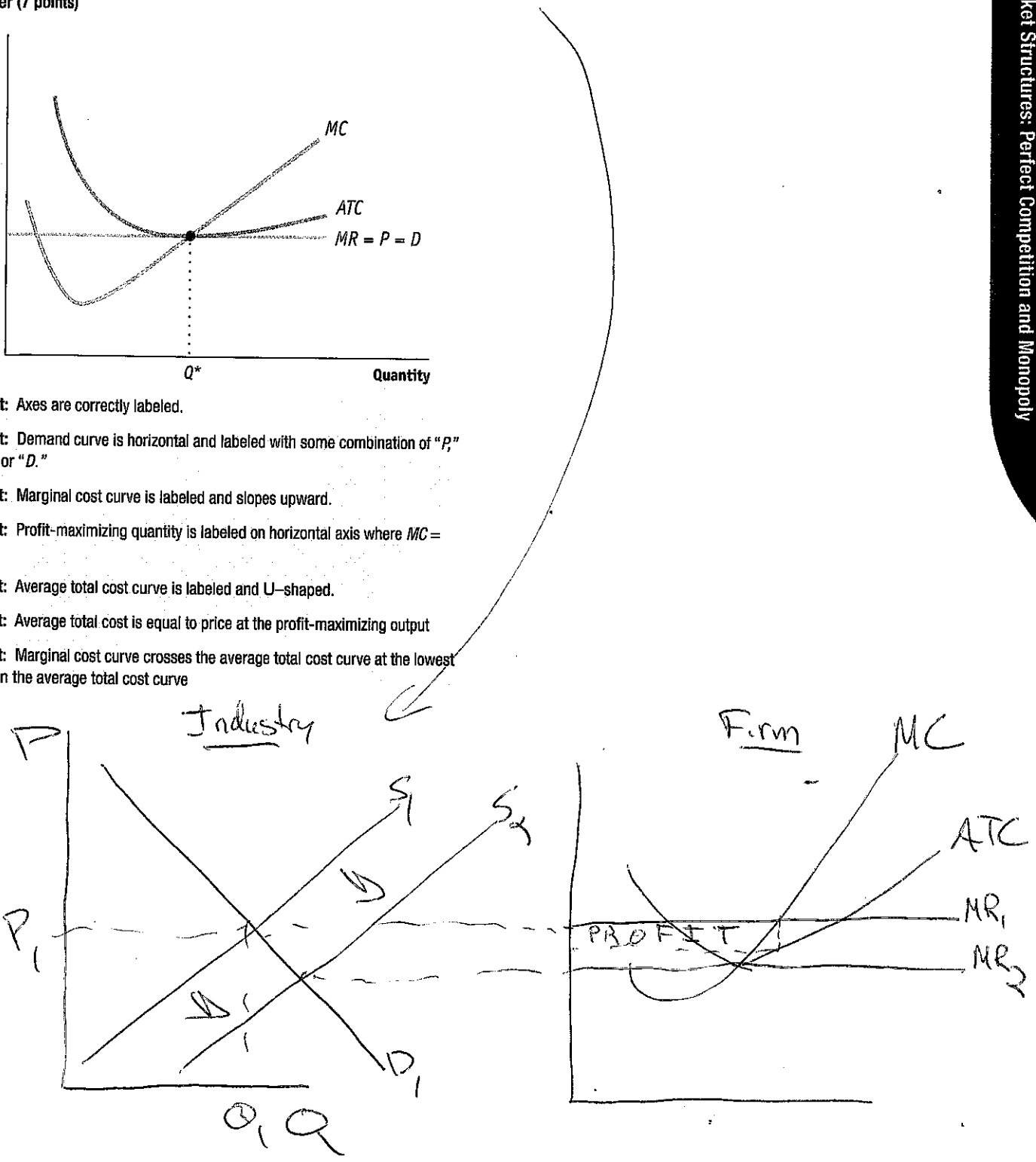
1 point: Profit-maximizing quantity is labeled on horizontal axis where *MC* = *MR*.

1 point: Average total cost curve is labeled and U-shaped.

1 point: Average total cost is equal to price at the profit-maximizing output

1 point: Marginal cost curve crosses the average total cost curve at the lowest point on the average total cost curve

2. Draw correctly labeled side-by-side graphs to show the long-run adjustment that would take place if perfectly competitive firms were earning a profit.

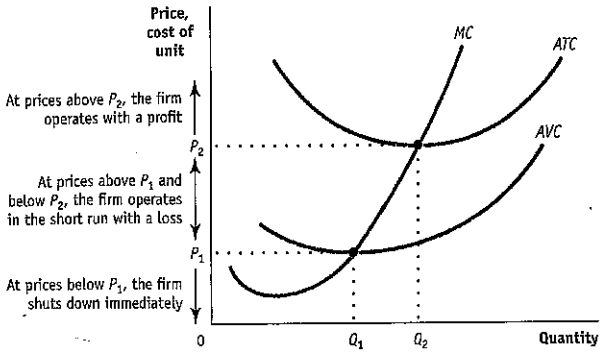


b. The profit-maximizing quantity is 4.
c. The firm's maximum profit is $TR - TC = (4 \times \$14) - \$56 = \$56 - \$56 = \$0$.

Module 23

Check Your Understanding

1.



a. The firm should shut down immediately when price is less than minimum average variable cost, the shut-down price. In the accompanying diagram, this is optimal for prices in the range from 0 to P_1.
b. When the price is greater than the minimum average variable cost (the shut-down price) but less than the minimum average total cost (the break-even price), the firm should continue to operate in the short run even though it is making a loss. This is optimal for prices in the range from P_1 to P_2.
c. When the price exceeds the minimum average total cost (the break-even price), the firm makes a profit. This happens for prices in excess of P_2.

2. This is an example of a temporary shut-down by a firm when the market price lies below the shut-down price, the minimum average variable cost. The market price is the price of a lobster meal and the variable cost is the cost of the lobster, employee wages, and other expenses that increase as more meals are served. In this example, however, it is the average variable cost curve rather than the market price that shifts over time, due to seasonal changes in the cost of lobsters. Maine lobster shacks have relatively low average variable cost during the summer, when cheap Maine lobsters are available; during the rest of the year, their average variable cost is relatively high due to the high cost of imported lobsters. So the lobster shacks are open for business during the summer, when their minimum average variable cost lies below price; but they close during the rest of the year, when the price lies below their minimum average variable cost.

Tackle the Test: Multiple-Choice Questions

1. e
2. d
3. b
4. d
5. c

Tackle the Test: Free-Response Questions

2. **a.** 6
b. $\$20 \times 6 = \$120$
c. $\$29.50 \times 6 = \$177$
d. $\$120 - \$177 = -\$57$ (or a loss of \$57)
e. No, because $P < AVC$

Module 24

Check Your Understanding

1. **a.** A fall in the fixed cost of production generates a fall in the average total cost of production and, in the short run, an increase in each firm's profit at the current output level. So in the long run new firms will enter the industry. The increase in supply drives down price and profits. Once profits are driven back to zero, entry will cease.

b. An increase in wages generates an increase in the average variable and the average total cost of production at every output level. In the short run, firms incur losses at the current output level, and so in the long run some firms will exit the industry. (If the average variable cost rises sufficiently, some firms may even shut down in the short run.) As firms exit, supply decreases, price rises, and losses are reduced. Exit will cease once losses return to zero.

c. Price will rise as a result of the increased demand, leading to a short-run increase in profits at the current output level. In the long run, firms will enter the industry, generating an increase in supply, a fall in price, and a fall in profits. Once profits are driven back to zero, entry will cease.

d. The shortage of a key input causes that input's price to increase, resulting in an increase in average variable and average total cost for producers. Firms incur losses in the short run, and some firms will exit the industry in the long run. The fall in supply generates an increase in price and decreased losses. Exit will cease when the losses for remaining firms have returned to zero.

2. In the accompanying diagram, point X_{MKT} in panel (b), the intersection of S_1 and D_1, represents the long-run industry equilibrium before the change in consumer tastes. When tastes change, demand falls and the industry moves in the short run to point Y_{MKT} in panel (b), at the intersection of the new demand curve D_2 and S_1, the short-run supply curve representing the same number of egg producers as in the original equilibrium at point X_{MKT}. As the market price falls, each individual firm reacts by producing less—as shown in panel (a)—as long as the market price remains above the minimum average variable cost. If market price falls below minimum average variable