

3. In a competitive industry, even among firms with *significant cost differences* (e.g. there are economic rents), why do profits tend to return to normal (0) in the long run?

Quantitative Applications

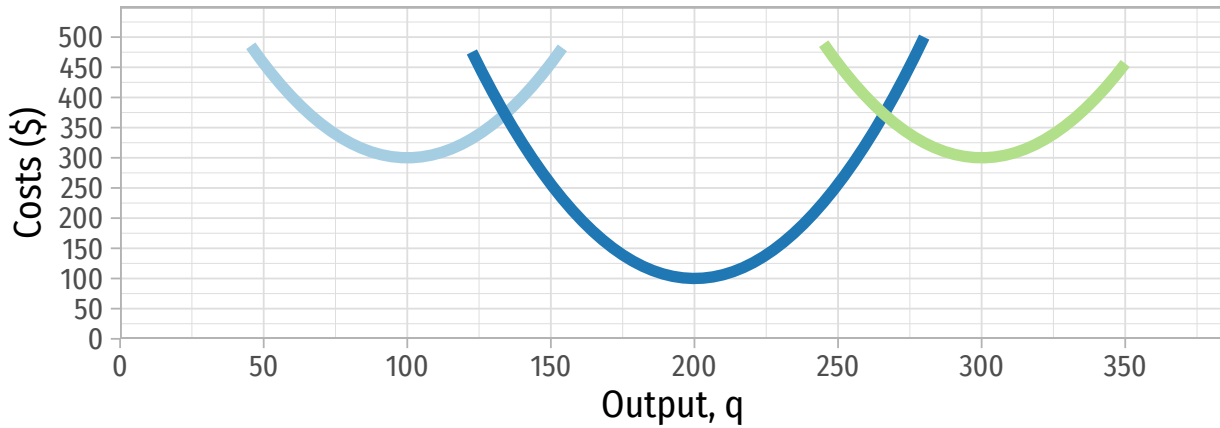
Show all work for calculations. You may lose points, even if correct, for missing work. Be sure to label graphs fully, if appropriate.

4. Frame de Art is an art framing shop in a small town. Frame de Art has one storefront (with a rent of \$500/week), and can hire workers for \$300/week per worker. The table below shows how output of framed art (in 100s/week) varies with the number of workers.

Output (hundreds)	Labor
0	0
1	1
2	3
3	6
4	11
5	20

Assuming labor is the only variable cost, make a table to calculate the *average cost* and *marginal cost* of 0, 1, 2, 3, 4, and 5 (hundred) framing jobs.

5. Mike's Bikes produces racing bicycles. Consider the following graph, which illustrates the short run average total cost curves corresponding to three possible plant sizes Mike could produce with: a small plant, a medium plant, and a large plant.



AC(q) by Plant Size ■ large ■ medium ■ small

- If Mike wanted to produce 125 bikes, what size plant should be used, and why? What about 150 bikes?
- If Mike wanted to produce 250 bikes, what size plant should be used, and why? What about 275 bikes?
- Draw the *long run average cost curve* on the graph provided (or sketch one yourself).
- Suppose Mike's long run total cost function can be roughly expressed as:

$$LRC(q) = \frac{1}{64}q^3 - 6.25q^2 + 725q$$

with a long run marginal cost function of

$$LRMC(q) = \frac{3}{64}q^2 - 12.5q + 725$$

Find the quantity of bikes where long run average cost is minimized. Plot this point on your graph. At what range of production does Mike experience economies of scale? At what range of production does Mike experience diseconomies of scale?

6. Daniel's Midland Archers has the following cost structure for producing archery bows:

$$C(q) = 2q^2 + 3q + 50$$
$$MC(q) = 4q + 3$$

- a. Write an equation for fixed costs, f .
- b. Write an equation for variable costs, $VC(q)$.
- c. Write an equation for average fixed costs, $AFC(q)$.
- d. Write an equation for average variable costs, $AVC(q)$.
- e. Write an equation for average (total) costs, $AC(q)$.
- f. At what price does Daniel's Midland Archers break even?
- g. Below what price would Daniel's Midland Archers shut down in the short-run?
- h. Write an equation for the firm's short-run inverse supply curve, and sketch a rough graph.
- i. What differences would there be between how Daniel's Midland Archers decides to produce in the short run versus the long run?
- j. In the long run, with many identical sellers of archery bows, what would be the equilibrium price?

7. Assume that consumers view tax preparation services as undifferentiated among producers, and that there are hundreds of companies offering tax preparation in a given market. The current market equilibrium price is \$120. Joe Audit's Tax Service has a daily short-run cost structure given by

$$C(q) = 100 + 4q^2$$
$$MC(q) = 8q$$

- a. How many tax returns should Joe prepare each day if his goal is to maximize profits?
- b. How much profit will he earn each day?
- c. At what market price would Joe break even?
- d. Below what hypothetical price would Joe shut down in the short run?