Practice problems: Marginal Analysis

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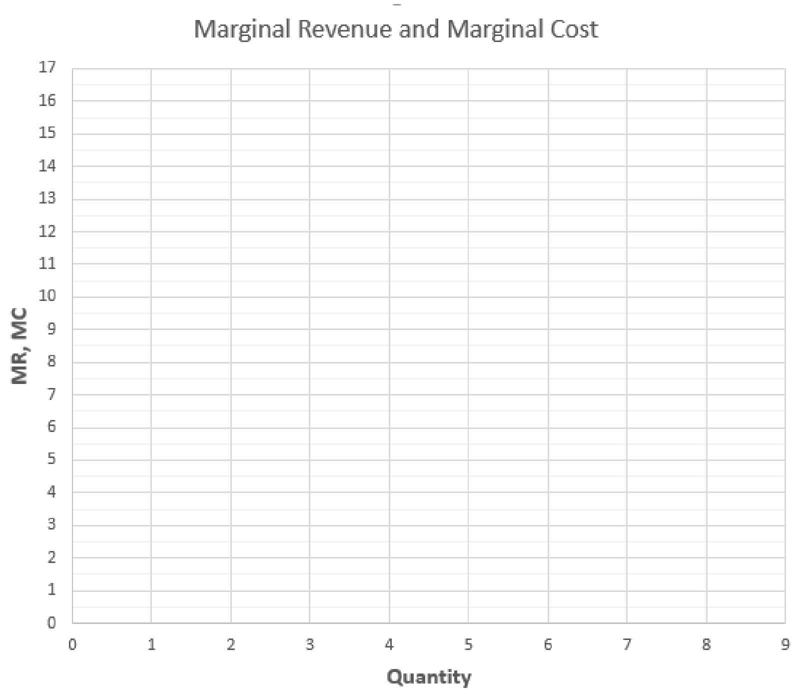
1. Imagine you have the following information about prices, hourly quantities and costs for a sandwich business in a highly competitive downtown area. The business has very little control over price: competitors are all selling sandwiches for $8 each so the business also prices its sandwiches at $8. The business will be able to sell any sandwiches it makes at this competitive price.

Fill in the missing values for the sandwich shop using the data in the table. Sketch the marginal revenue and marginal cost curves. How many sandwiches should they sell to maximize profit? Explain using the table and the graph.

Quantity	Price	Total Revenue (P*Q)	Marginal Revenue ΔTR/ΔQ	Total Cost	Marginal Cost ΔTC/ΔQ	Profit TR-TC
0	8			2		
1	8			3.5		
2	8			7		
3	8			12.5		
4	8			20		
5	8			29.5		
6	8			41		
7	8			54.5		
8	8			70		

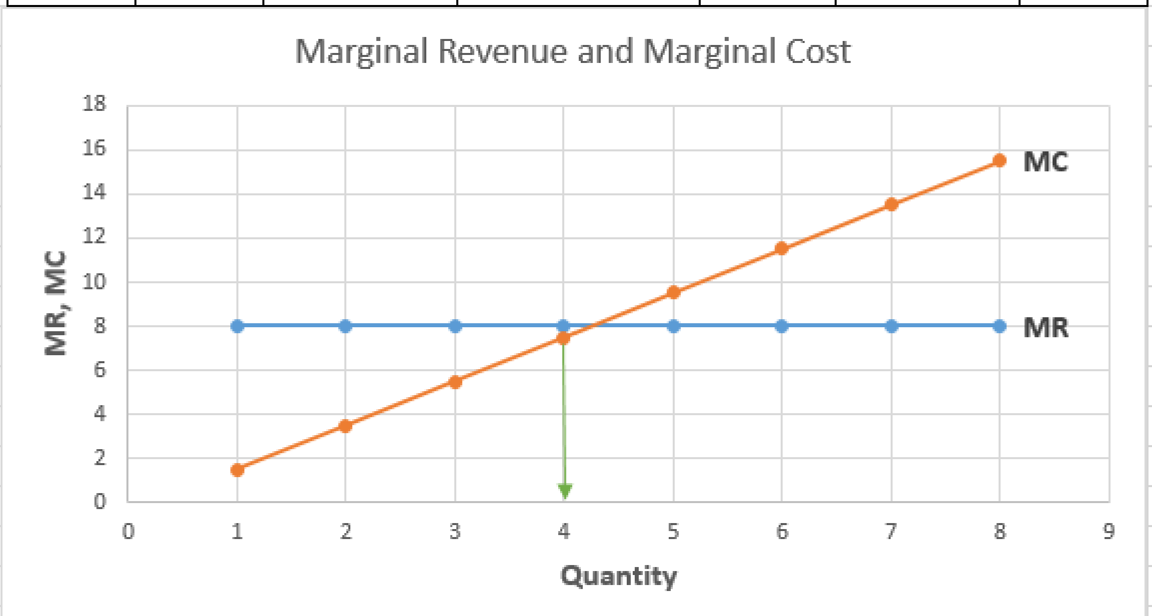


2. Suppose the demand curve for haircuts from a barber can be described as P = 30 – 2Q (implying a marginal revenue curve of MR = 30 – 4Q). The barber's total cost curve is TC = 20 + 2Q (implying a marginal cost curve of MC = 2). Find the profit-maximizing quantity of output (at which MR = MC). What is the barber's profit at this output level? (Hint: calculate TR and TC at the profit-maximizing output level).

Answers:

1. Marginal cost in the table is calculated as ΔTC/ΔQ, so the marginal cost of the first sandwich is (3.5-2)/1 = 1.5. Marginal revenue is calculated as ΔTR/ΔQ, so the marginal revenue from the first sandwich is (8-0)/1 = 8. Notice that marginal revenue is constant and equal to the price of the sandwich in this example. Marginal cost is increasing. Profit is highest when the store sells 4 sandwiches per hour. Using marginal analysis, we reach this same conclusion: the 4^{th} sandwich brings extra revenue of $8 and costs an extra $7.50 to produce but the 9^{th} sandwich would bring less in revenue than it costs to produce.

Quantity	Price	Total Revenue	Marginal Revenue	Total Cost	Marginal Cost	Profit
0	8	0		2		-2
1	8	8	8	3.5	1.5	4.5
2	8	16	8	7	3.5	9
3	8	24	8	12.5	5.5	11.5
4	8	32	8	20	7.5	12
5	8	40	8	29.5	9.5	10.5
6	8	48	8	41	11.5	7
7	8	56	8	54.5	13.5	1.5
8	8	64	8	70	15.5	-6



2. Set MR = MC. So, 30 – 4Q = 2 → 28 = 4Q → Q = 7

When Q = 7, P = 30 – 2(7) = 16 and Total Revenue = P * Q = $16*7 = $112

When Q = 7, Total Cost = 20 + 2(7) = 34

Profit = TR – TC = 112 – 34 = $78