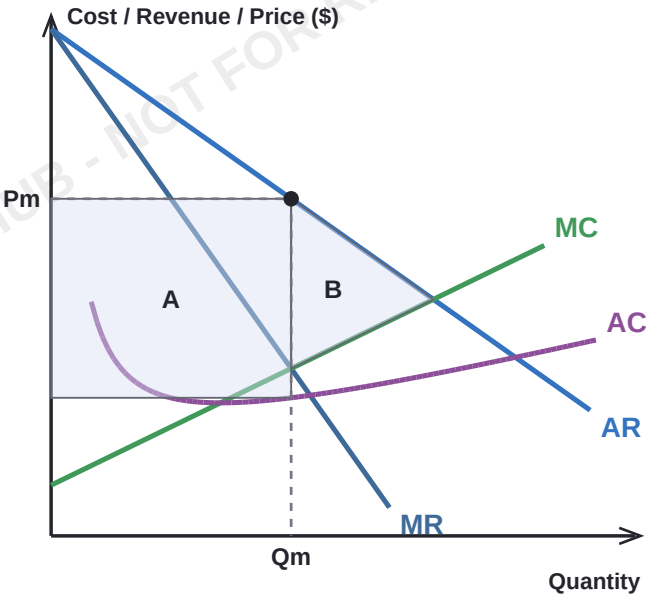
FREE SAMPLE: THE FIRST QUESTION

Question One (21 marks)

(a) A monopoly sells a regional airport. Graph One shows its demand (AR), marginal revenue (MR), marginal cost (MC) and average cost (AC) curves. The profit-maximising price and quantity are marked Pm and Qm, and two areas are lettered.

Using the labels and letters on Graph One, state: (i) the area of supernormal profit; (ii) the area of deadweight loss; (iii) whether Pm is above, below or equal to MC at Qm.

[3 marks]



Graph One: A monopoly (the monopolist's revenue and cost curves)

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(b) The monopoly's demand is P = 52 − 1Q and its total cost is TC = 19 + 22Q + 2Q², where Q is in thousand units and TC is in $ thousand. Use marginal analysis to find the profit-maximising output and price, then calculate total revenue, total cost and profit. State whether the profit is supernormal, normal or a loss.

[4 marks]

(c) Explain why the monopoly produces Qm and not a higher or lower quantity, using marginal analysis, and explain whether the monopoly is allocatively efficient. Use your answers to the calculation and Graph One.

[5 marks]

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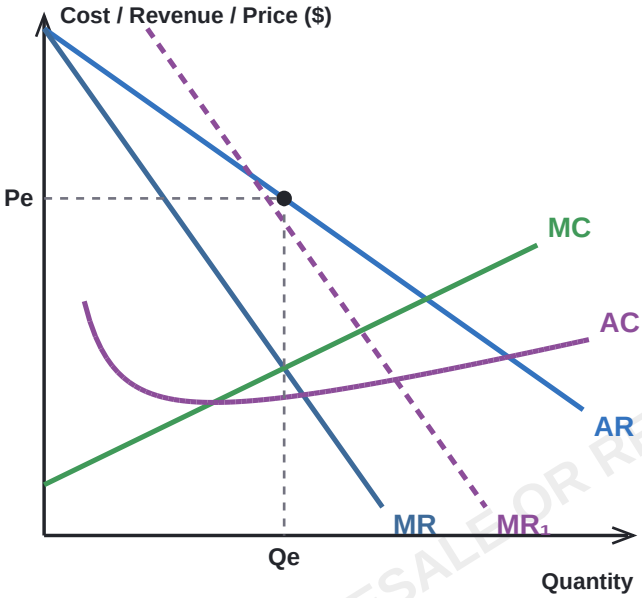
(d) The demand for a rail link between two cities rises, which raises the price a buyer will pay at every quantity by $12. Before the increase, demand was P = 40 − 1Q; the monopoly's total cost is TC = 51 + 10Q + 2Q² (Q in thousand units, TC in $ thousand). Graph Two shows the new marginal revenue curve MR_1.

Calculate the profit-maximising output and price, and the profit, before and after the increase in demand.

[4 marks]



Graph Two: A monopoly before and after an increase in demand

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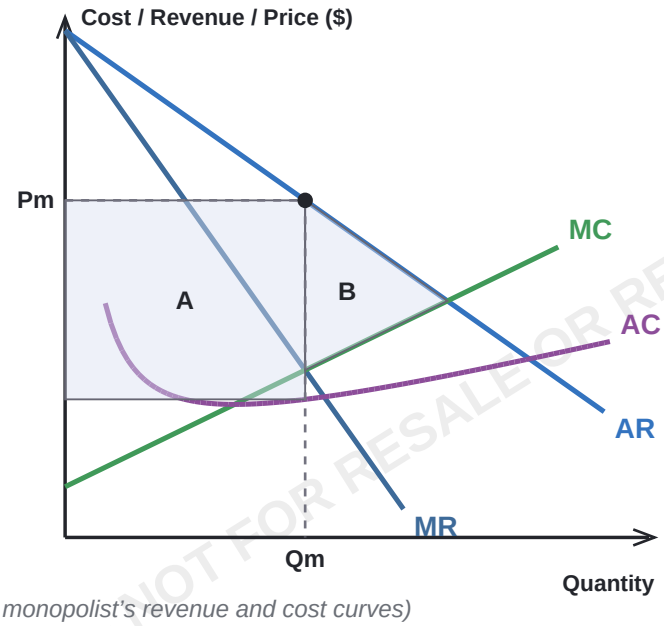
(e) Using marginal analysis and Graph Two, explain the profit-maximising output after the increase in demand. Then explain the type of profit made before and after the increase, and how the monopoly will respond to the change in profit.

[5 marks]

THE WORKED ANSWER TO THAT QUESTION

Question 1 (21 marks) [Monopoly]

(a) A monopoly sells a regional airport. Graph One shows its demand (AR), marginal revenue (MR), marginal cost (MC) and average cost (AC) curves. The profit-maximising price and quantity are marked Pm and Qm, and two areas are lettered. Using the labels and letters on Graph One, state: (i) the area of supernormal profit; (ii) the area of deadweight loss; (iii) whether Pm is above, below or equal to MC at Qm.



Graph One: A monopoly (the monopolist's revenue and cost curves)

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(a) Answer: (i) A; (ii) B; (iii) Pm is above MC (P > MC)

- Evidence level: Achieved (reads the profit and deadweight-loss areas and compares price with marginal cost).
- Supernormal profit is the rectangle between price Pm and average cost AC at Qm, out to Qm: area A.
- Deadweight loss is the triangle between AR (demand) and MC for the units between Qm and the output where AR = MC: area B.
- At Qm the price Pm is above MC (MC is read from the MC curve directly below the point on AR), so P > MC.

> **KEY TAKEAWAY**
> Supernormal profit is the rectangle (P − AC) × Q; the deadweight loss is the triangle between demand and marginal cost beyond Qm; a monopolist charges more than marginal cost.

(b) The monopoly's demand is P = 52 − 1Q and its total cost is TC = 19 + 22Q + 2Q², where Q is in thousand units and TC is in $ thousand. Use marginal analysis to find the profit-maximising output and price, then calculate total revenue, total cost and profit. State whether the profit is supernormal, normal or a loss.

(b) Answer: Qm = 5 thousand; Pm = $47; TR = $235 thousand; TC = $179 thousand; profit =

$56 thousand (supernormal profit)

- Evidence level: Merit (derives MR and MC, sets MR = MC and finds revenue, cost and profit).
- MR = 52 − 2Q (twice as steep as demand) and MC = 22 + 4Q.
- Set MR = MC: 52 − 2Q = 22 + 4Q, so 6Q = 30 and Qm = 5 thousand.
- Price from demand: Pm = 52 − 1 × 5 = $47.
- Total revenue = 47 × 5 = $235 thousand. Total cost = 19 + 22 × 5 + 2 × 5^2 = $179 thousand.
- Profit = 235 − 179 = $56 thousand: this is supernormal profit.

> **KEY TAKEAWAY**
> A monopoly produces where MR = MC, then reads the price from the demand curve above that output (not from MR).

(c) Explain why the monopoly produces Qm and not a higher or lower quantity, using marginal analysis, and explain whether the monopoly is allocatively efficient. Use your answers to the calculation and Graph One.

(c) Answer: MR = MC at Qm; P > MC so allocatively inefficient; deadweight loss $2.5 thousand

- Evidence level: Excellence (uses marginal analysis both sides of Qm and quantifies the inefficiency).
- Achievement: The monopoly produces where MR = MC because that maximises profit. It is allocatively inefficient because the price is above marginal cost.
- Merit: At Qm = 5 thousand, MR = MC = $42. Below Qm each extra unit adds more to revenue than to cost (MR > MC), so profit rises if output rises; above Qm each extra unit adds more to cost than to revenue (MR < MC), so profit falls. The price Pm = $47 is read from the demand curve, and it is above MC ($42).
- Excellence: At Qm = 5 thousand, MR = MC = $42. Below Qm each extra unit adds more to revenue than to cost (MR > MC), so profit rises if output rises; above Qm each extra unit adds more to cost than to revenue (MR < MC), so profit falls. The price Pm = $47 is read from the demand curve, and it is above MC ($42). Allocative efficiency needs price = marginal cost (so that the value placed on the last unit by buyers equals the cost of producing it, and total surplus is as large as it can be). Here P exceeds MC by $5, so buyers value the units between Qm = 5 and Qc = 6 thousand above their marginal cost but the monopoly does not produce them: the deadweight loss (area B) is ½ × 5 × 1 = $2.5 thousand. A monopoly restricts output and raises price because it faces a downward-sloping demand curve: to sell more it must lower the price on all units, so MR falls below AR.

> **KEY TAKEAWAY**
> A monopolist maximises profit where MR = MC, but charges P > MC, so it produces less than the allocatively efficient output and causes a deadweight loss.

(d) The demand for a rail link between two cities rises, which raises the price a buyer will pay at every quantity by $12. Before the increase, demand was P = 40 − 1Q; the monopoly's total cost is TC = 51 + 10Q + $2Q^2$ (Q in thousand units, TC in $ thousand). Graph Two shows the new marginal revenue curve MR_1. Calculate the profit-maximising output and price, and the profit, before and after the increase in demand.

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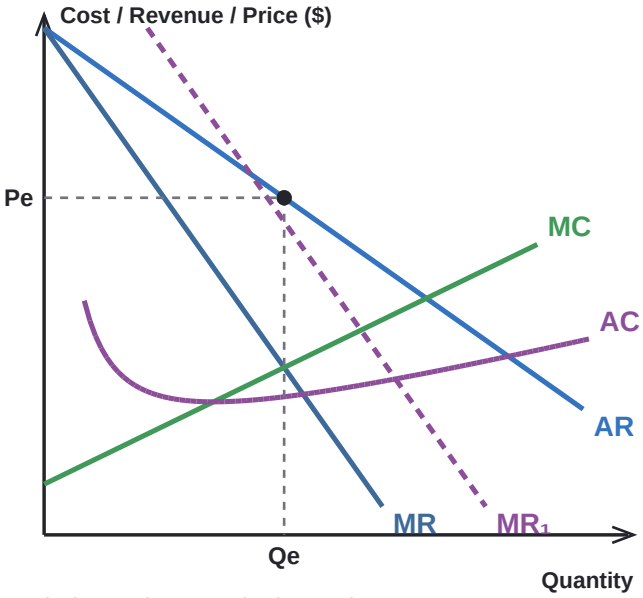

Graph Two: A monopoly before and after an increase in demand

(d) Answer: Before: Qe = 5, Pe = $35, profit = $24 thousand; after: Q_1 = 7, P_1 = $45, profit = $96 thousand

- Evidence level: Merit (repeats MR = MC for both demand curves and compares the profits).
- After the increase, demand is P = 52 − 1Q, so MR_1 = 52 − 2Q.
- Before: MR = MC gives 40 − 2Q = 10 + 4Q, so Qe = 5 thousand, Pe = $35, TR = $175 thousand, TC = $151 thousand, profit = $24 thousand (supernormal profit).
- After: MR_1 = MC gives 52 − 2Q = 10 + 4Q, so Q_1 = 7 thousand, P_1 = $45, TR = $315 thousand, TC = $219 thousand, profit = $96 thousand (supernormal profit).

> **KEY TAKEAWAY**
> After a demand increase both AR and MR shift right, so the MR = MC point moves to a higher output and price; recalculate revenue, cost and profit.

(e) Using marginal analysis and Graph Two, explain the profit-maximising output after the increase in demand. Then explain the type of profit made before and after the increase, and how the monopoly will respond to the change in profit.

(e) Answer: Q rises to 7 thousand and price to $45; profit supernormal profit → supernormal profit

- Evidence level: Excellence (applies MR = MC to the new curve and links the profit to barriers to entry).
- Achievement: The new MR curve (MR_1) cuts MC further to the right, so the monopoly produces more (Q_1 > Qe) at a higher price. Profit changes from supernormal profit to supernormal profit.
- Merit: The new MR curve (MR_1) cuts MC further to the right, so the monopoly produces more (Q_1 > Qe) at a higher price. Profit changes from supernormal profit to supernormal profit. At Qe, MR_1 is above MC, so producing more adds more to revenue than to cost; profit keeps rising until MR_1 = MC at Q_1 = 7 thousand. The price rises to P_1 = $45 (read from the new demand curve AR_1). Profit moves from $24 thousand (supernormal profit) to $96 thousand (supernormal profit).
- Excellence: The new MR curve (MR_1) cuts MC further to the right, so the monopoly produces more (Q_1 > Qe) at a higher price. Profit changes from supernormal profit to supernormal profit. At Qe, MR_1 is above MC, so producing more adds more to revenue than to cost; profit keeps rising until MR_1 = MC at

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Q_1 = 7 thousand. The price rises to P_1 = \$45 (read from the new demand curve AR_1). Profit moves from \$24 thousand (supernormal profit) to \$96 thousand (supernormal profit). Marginal analysis: at every output below Q_1 the marginal revenue from MR_1 exceeds marginal cost, so the monopoly would add output until they are equal. Because the monopoly is protected by barriers to entry (such as patents, licences or control of a key resource), new firms cannot enter to compete the supernormal profit away, so it can continue in the long run. The monopoly will keep producing at Q_1, and may use the profit to invest, to defend its position or to expand.

KEY TAKEAWAY

An increase in demand moves MR to the right; the monopoly produces where MR_1 = MC and any supernormal profit survives because barriers to entry stop new firms entering.

LOS: Monopoly (91400)

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