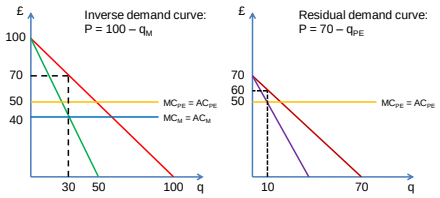
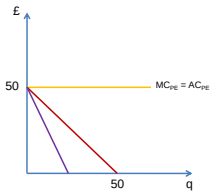
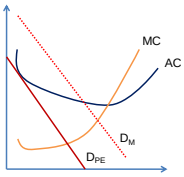
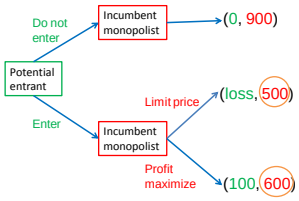
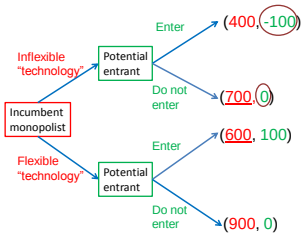
Reading map:

These topics are discussed in Chapter 11 of the Carlton and Perloff text book, on pages 350-378. This chapter will be the main focus of Section C of the exam. Hence, make sure that you are able to "solve" the game theoretic problems discussed in the lecture, and the ones in Tutorial 4, step by step. The exam questions will be different, of course, but they will follow the same logic.

Limit pricing – incumbent has cost advantage – I  	The incumbent monopolist faces the market demand ($P = 100 - q_M$). It maximises profit by setting MC equal to MR. The profit maximising output is 30, and the price per unit is 70. Given that the incumbent is producing 30, the new entrant faces the <u>residual demand</u> ($P = 70 - q_{PE}$). It also maximises profits by setting MC equal to MR. The entrants profit maximising output is 10, and it charges a price of 60 per unit.
Limit pricing – incumbent has cost advantage – II • Profit maximisation of incumbent monopolist: Demand: $P = 100 - q$ MR = MC: $100 - 2q = 40$ Equilibrium: $q_M = 30$, $P = 70$, $\pi_M = (70 - 40) \times 30 = 900$ • Profit maximisation for potential entrant: Residual demand: $P = 70 - q$ MR = MC: $70 - 2q = 50$ Equilibrium: $q_{PE} = 10$, $P = 60$, $\pi_{PE} = (60 - 50) \times 10 = 100$ • Monopolist matches the potential entrant's price: New profit: $\pi_M = (60 - 40) \times 30 = 600$ $\Rightarrow$ 33% decline in profit	Before the entry of the new firm, the incumbent monopolist's profit is 900. After entry, the new firm has a profit of 100. (The slide to the left explains how we get these figures.) However, once the new entrant starts charging a price of 60, the incumbent monopolist can no longer continue to charge a price of 70. It has to match the price of the new entrant, and this leads to a drop in the incumbent monopolist's profit to 600. (During the tutorial, we discussed why the output of the incumbent monopolist is kept unchanged even as the price it charges drops to 60. If you were not at the tutorial, you can discuss it with me in person.)
Limit pricing – incumbent has cost advantage – III  • Incumbent monopolist sets price just below 50 • $q_M = 50$, $\pi_M = (50 - 40) \times 50 = 500$ • At P = 50 (or just short of it) $q_{PE} = 0$, i.e., entry does not occur	Since the incumbent monopolist does not want competition from the new entrant, it threatens to charge the <u>limit price</u>. Note that the incumbent has a cost advantage over the new entrant; the average cost of the former is 40, while that of the latter is 50. If, therefore, the incumbent charges a <u>limit price</u> that is just less than 50 per unit, the entrant (who will have to match this price) will necessarily make a loss. However, since this price is above 40, the incumbent monopolist will continue to make a profit. If the limit price is (just about) 50, the demand curve of $P = 100 - q_M$ implies that the incumbent monopolist will have an output of 50 as well. Its profit will, therefore, be 500. (See slide to the left for computation.)

Limit pricing – incumbent has no advantage  • If MC (= AC) does not change with output, incumbent will not make any profit with limit pricing • If there are economies of scale, i.e., average cost decreases with output, limit pricing might still be feasible	What if the incumbent monopolist does not have a cost advantage over the new entrant, but there are economies of scale such that the average cost curve is downward sloping up to some level of output? Remember that the main idea behind limit pricing is to shift the demand curve of the entrant to the point such that it can charge no price at which it can make a profit. Hence, the monopolist sets its output at a level such that the residual demand curve of the new entrant is D_M. All points on this demand curve lie below the average cost curve (AC), i.e., the new entrant cannot charge any price at which it can make a profit. However, since the incumbent monopolist has a positive output level, it enjoys economies of scale, such that its average cost is now reduced, and it can therefore earn a profit.
Limit pricing – is it credible?  • Profit maximisation is always the best choice for the incumbent • Limit pricing is not a credible threat	Game theorists argue that limit pricing does not work. Consider the game tree in the slide to the left. The potential entrant has to make the strategic choice between entering and not entering. If it does not enter, the incumbent monopolist retains its monopoly, and continues to maximise profit, earning a payoff of 900. Since the potential entrant does not enter, it makes neither a profit nor a loss, and earns a payoff of 0. If the potential entrant actually enters, the incumbent monopolist can either continue to maximise profit, charging the same price as the entrant; or it can charge the limit price. If the incumbent monopolist charges the limit price, its payoff is 500, while the entrant makes a loss. If, on the other hand, the incumbent monopolist does not charge the limit price, it earns a payoff of 600, while the entrant earns a payoff of 100. (All the payoffs were computed in an earlier slide.) The potential entrant knows that if it does enter, the incumbent will not charge the limit price, since its payoff from the limit price is 500, while its payoff from profit maximisation is 600. Since limit price is ruled out as a credible option of the incumbent monopolist, the potential entrant can either enter and earn a payoff of 100, or stay out and earn a payoff of 0. The rational choice would, therefore, be to enter. In other words, in equilibrium, the potential entrant will enter and the incumbent monopolist will maximise profit (i.e., not charge the limit price).

Pre-commitment and credibility



- The incumbent monopolist pre-commits to £200 expenses that the potential entrant has to match
- Limit pricing is now a credible threat

In Tutorial 4, we discussed the solution to a game where the incumbent monopolist, who realises that the threat of charging the limit price is not credible, has to choose between a flexible and an inflexible technology, with the objective of preventing entry by the potential entrant. This game involves different payoffs, but the logic is exactly the same. In equilibrium, the incumbent monopolist will choose an inflexible technology, and the potential entrant will stay out. If you cannot arrive at that equilibrium, you can discuss it with me in person.

Inflexible "technology" and raising costs

- Production capacity
- Research and development
- Advertising expenses
- Government regulations ("grandfathering")
- Wages and salaries
- Tie-ins with other products
- Raise switching costs

These strategies are discussed in the section entitled "Raising Rivals' Costs", which starts on page 371 of the Carlton and Perloff text book.

Predatory pricing

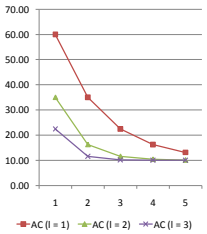
- Key issue
  - Credibility of the threat of sustained predatory pricing
- Entrant's strategy
  - Merger or takeover
  - Price contract with buyers
  - Reduce output to minimise impact of predatory pricing
- Legal view
  - There is predatory pricing if the price is below the short run marginal cost or (to ease computation) average cost

Predatory pricing is very similar to limit pricing; a firm charges a low price in the short run (generally lower than the cost of production) to drive out competitors, so as to enjoy monopoly power in the long run. The essential difference is that a firm uses predatory pricing against firms that have already entered the market as competitors. Read the discussion on pages 352-360 of the Carlton and Perloff text book.

Learning by doing

$AC = 10 + \{100/2^{\lambda Q}\}$
where
λ = rate of learning
Q = quantity

Q	AC ($\lambda = 1$)	AC ($\lambda = 2$)	AC ($\lambda = 3$)
1	60.00	35.00	22.50
2	35.00	16.25	11.56
3	22.50	11.56	10.20
4	16.25	10.39	10.02
5	13.13	10.10	10.00



If there is learning by doing, such that the average cost of production declines with output, then an incumbent firm that has produced something much longer than a new entrant may have an advantage over the latter. In the slide to the left, AC depends on both the amount produced (Q) and the rate of learning (λ). We have already argued that with learning by doing the average cost declines with output. If an incumbent firm learns fast (i.e., λ is high), its average cost falls even faster. This can be seen from the table. For a given λ, as we go down the column, average cost decreases with quantity. Similarly, for a given output level, as we go across a row, average cost decreases as λ increases. Consider now a new firm for which Q = 1. In the presence of learning by doing, its AC will be lower than that of an incumbent firm whose Q = 5. The difference in cost will be even more stark if the incumbent

	learns at a faster pace than the new entrant. If an industry is characterised by learning by doing, therefore, the entry barrier is high for new firms.