

Chapter 13:

Monopolies

Consumers prefer markets to be *perfectly competitive* because then the prices are as low as possible.

Producers would prefer to be a *monopoly* because there is no one to compete against and they can charge higher prices.

Monopolist = a firm that is the only producer of a good that has no close substitutes.

Examples:

Athletes



Diamonds (De Beers in the 1880s)



Patented or copyrighted goods

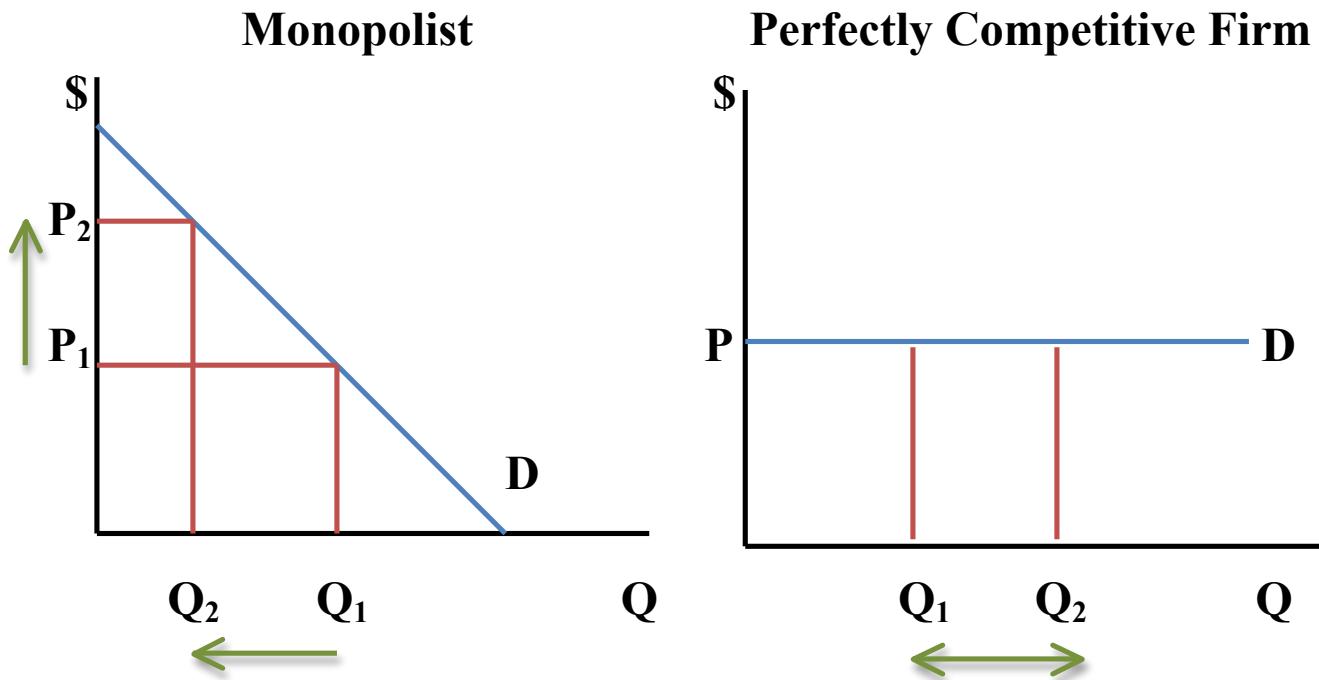


China's Salt Commission (state monopoly)



- Producers in a perfectly competitive market are price takers
- Monopolists have market power, or the ability to raise prices, so they are price setters.

Consumers have no other options for buying the good, so demand is not perfectly elastic → consumers will pay a higher price if the quantity is smaller, or vice versa



To sell Q_1 the monopolist would have to charge only P_1 .

If it reduces output to Q_2 it can charge P_2 .

Monopolies can only exist if there are barriers to entry
(otherwise other firms would be attracted to the profitable market)

Possible Barriers to Entry

1. Control of a scarce resource or input.

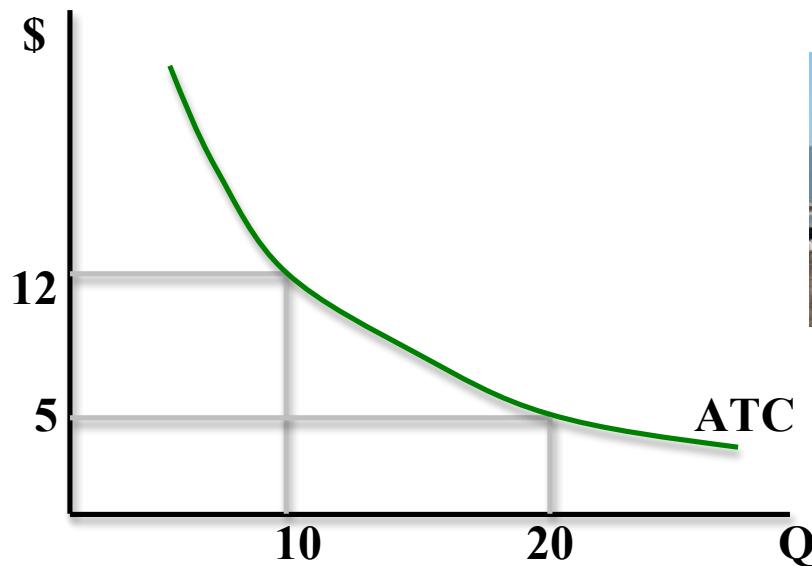
- E.g. de Beers controlled over 90% of the diamond market until the 1980s.
- E.g. Pharmaceutical companies and drug formulas



2. Economies of scale = for firms with very large fixed costs, ATC will be decreasing over the relevant range of output because of a strong spreading effect

- These firms are natural monopolies
- As Q increases ATC decreases, so
- New entrants producing smaller quantities would have higher ATC and would therefore not be able to compete.
- It will cost less for one firm to supply the entire market rather than many firms each producing smaller quantities.

Examples: railways, electricity, skytrains



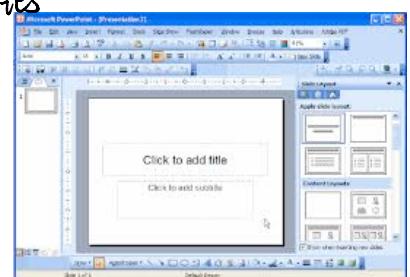
One firm can produce 20 units for a total cost of

$$\$5 \cdot 20 = \$100$$

Two firms, each producing 10 units, would have a total cost of $2 \cdot \$12 \cdot 10 = \240

3. Technological superiority or network externalities

- E.g. Software: Word, Excel, Power Point, etc
- Consumers need to use what everyone else is using.



4. Government created barriers,

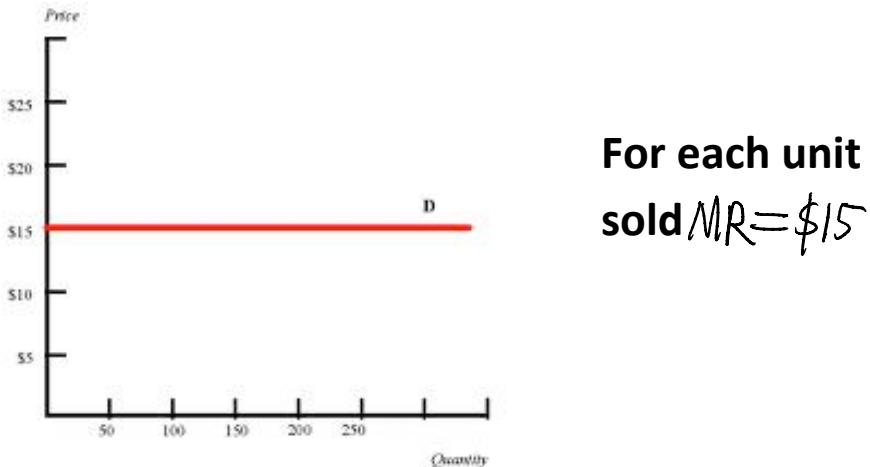
- Patents (20 years) and copyrights (50 years)
- Both provide incentive for inventions and creativity

A Single-Price Monopolist

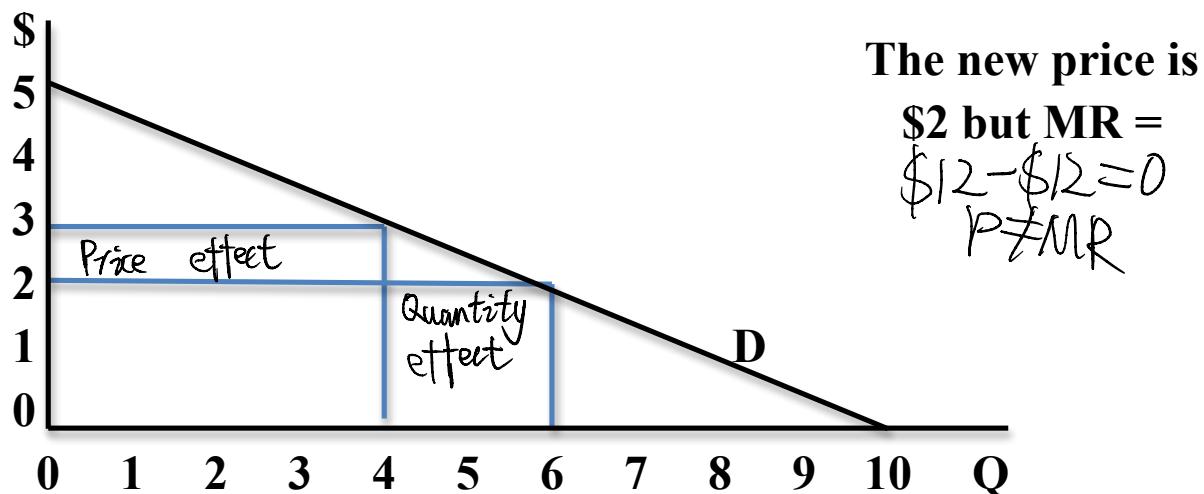
All firms produce where $MR = MC$

For a firm in a perfectly competitive market

$MR = P$ because the price remains constant when Q changes.



For a monopolist a change in Q requires a change in P for all units sold
The change in TR depends on the *price effect* compared to so $P \neq MR$
the *quantity effect* (Ch 6).



When monopolists change their quantity, they must charge the price given by the market demand curve.

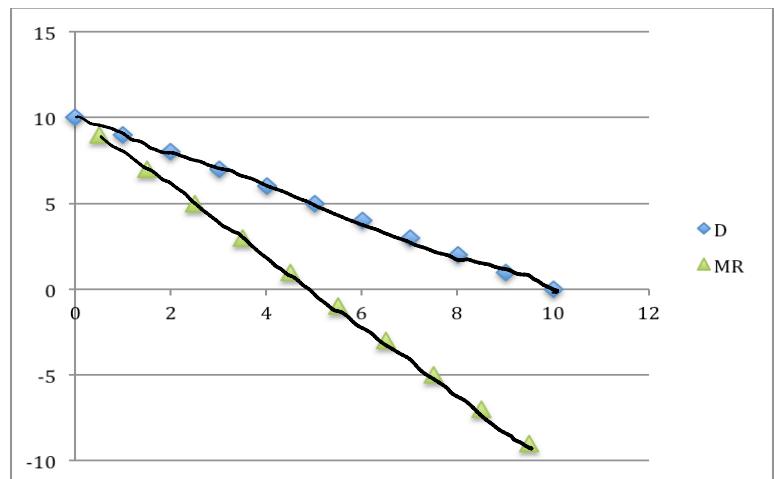
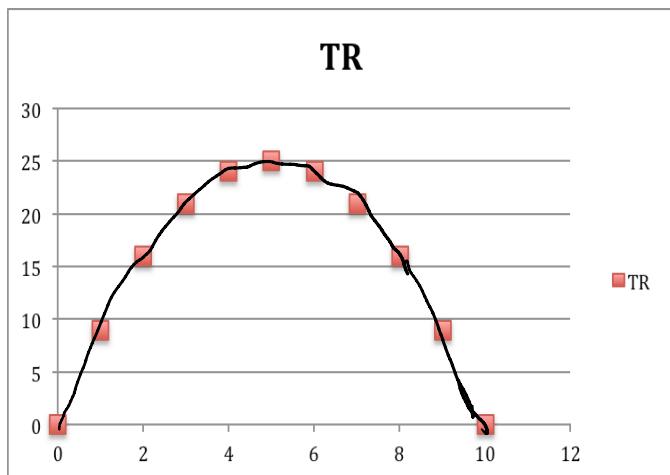
Increasing the price may increase or decrease total revenue, depending on the price elasticity of demand.

Inelastic demand: $P \uparrow \times Q \downarrow = TR \uparrow$ stronger price effect $E < 1$

Elastic demand: $P \uparrow \times Q \downarrow = TR \downarrow$ stronger quantity effect $E > 1$

Unit elastic demand: $P \uparrow \times Q \downarrow = \overline{TR}$ equal effects $E=1$

| Q | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|----|----|---|----|----|----|----|----|----|----|----|----|
| P | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TR | 0 | 9 | 16 | 21 | 24 | 25 | 24 | 24 | 16 | 9 | 0 |
| MR | 9 | 7 | 5 | 3 | 2 | -1 | -3 | -5 | -7 | -9 | |



For $0 \leq Q \leq 5$ demand is elastic

For $5 \leq Q \leq 10$ demand is inelastic

Monopolists will only produce in the elastic portion of D
only because $MR \geq 0$.

Finding the Profit Maximizing Output

A monopoly will want to maximize profit by finding the output where:

| Q | P | TR | MR | TC | MC | ATC | Profit |
|----|----|----|----|----|----|-----|--------|
| 0 | 10 | 0 | | 5 | | - | -5 |
| | | | 9 | | 3 | | |
| 1 | 9 | 9 | | 8 | | 8 | 1 |
| | | | 7 | | 1 | | |
| 2 | 8 | 16 | | 9 | | 4.5 | 7 |
| | | | 5 | | 2 | | |
| 3 | 7 | 21 | | 11 | | 3.7 | 10 |
| | | | 3 | | 3 | | |
| 4 | 6 | 24 | | 14 | | 3.5 | 10 |
| | | | 1 | | 4 | | |
| 5 | 5 | 25 | | 18 | | 3.6 | 7 |
| | | | -1 | | 5 | | |
| 6 | 4 | 24 | | 23 | | 3.8 | 1 |
| | | | -3 | | 6 | | |
| 7 | 3 | 21 | | 29 | | 4.1 | -8 |
| | | | -5 | | 7 | | |
| 8 | 2 | 16 | | 36 | | 4.5 | -20 |
| | | | -7 | | 8 | | |
| 9 | 1 | 9 | | 44 | | 4.9 | -35 |
| | | | -9 | | 9 | | |
| 10 | 0 | 0 | | 53 | | 5.3 | -53 |

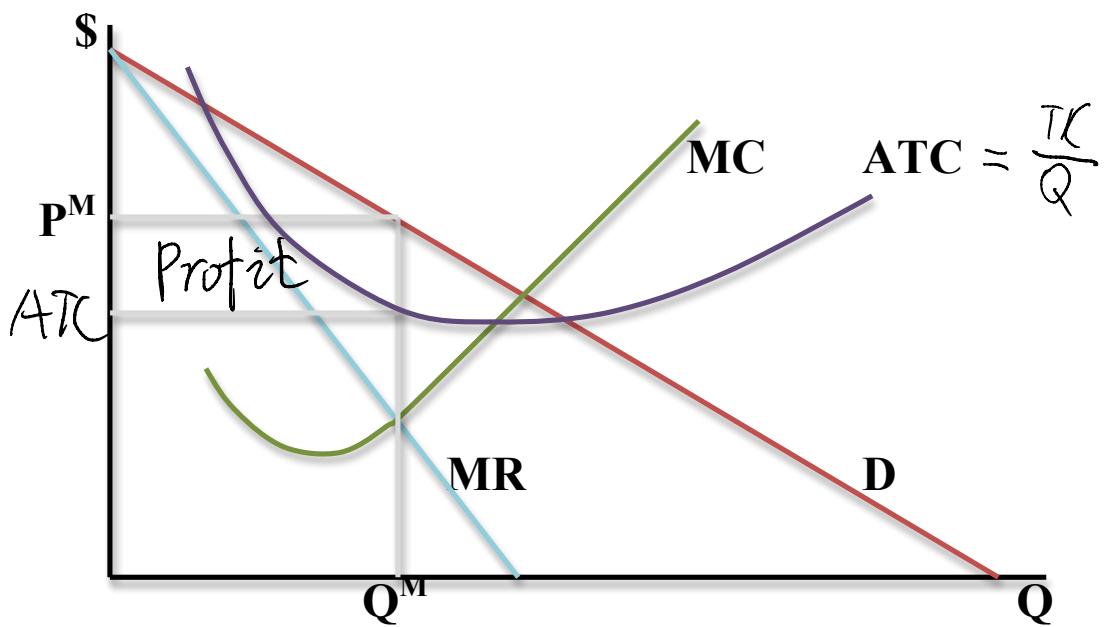
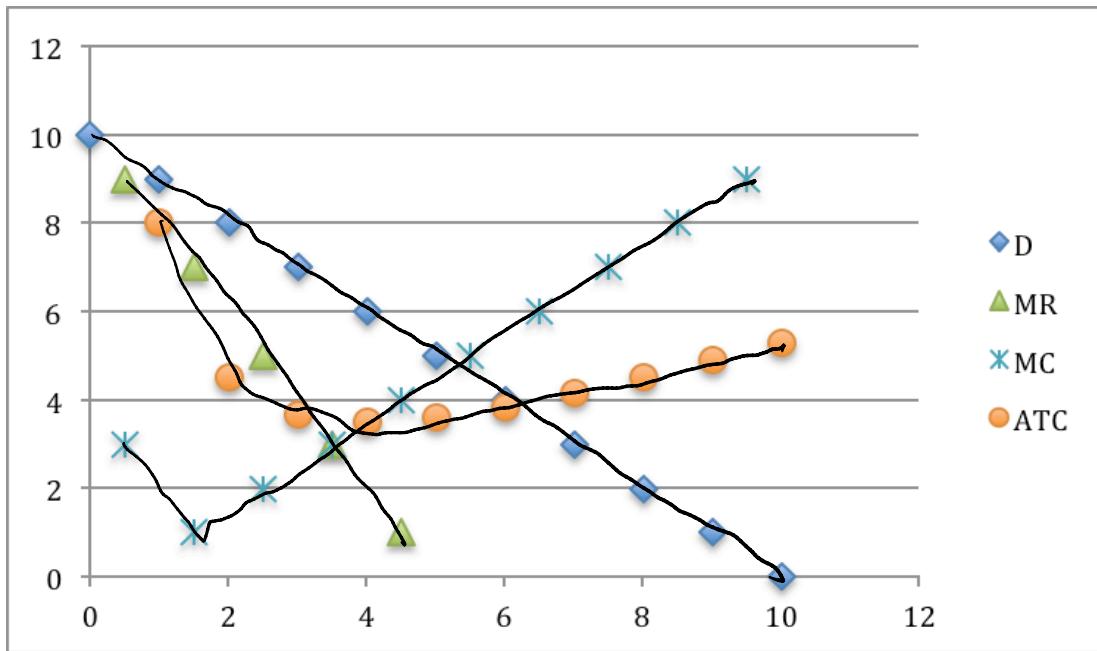
The profit maximizing quantity = 4

Price = 6

ATC = 3.5

Profit = 10

Note that the profit maximizing quantity is not the same as the revenue maximizing quantity.



The monopoly produces Q^M and charges P^M , and profits = $(P^M - ATC) Q^M$

Monopolies can make economic profits in the short run and long run because there is no entry.

Exercise 1: Fill in the table

| Q | P | TR | MR | TC | MC | ATC | Profit |
|---|----|----|-----|----|----|----------------|--------|
| 0 | 16 | 0 | | 2 | | | -2 |
| | | | 14 | | 2 | | |
| 1 | 14 | 14 | | 4 | | 4 | 10 |
| | | | 10 | | 4 | | |
| 2 | 12 | 24 | | 8 | | 4 | 16 |
| | | | 6 | | 6 | | |
| 3 | 10 | 30 | | 14 | | $\frac{14}{3}$ | 16 |
| | | | 2 | | 8 | | |
| 4 | 8 | 32 | | 22 | | $\frac{11}{2}$ | 10 |
| | | | -2 | | 10 | | |
| 5 | 6 | 30 | | 32 | | $\frac{32}{5}$ | -2 |
| | | | -6 | | 12 | | |
| 6 | 4 | 24 | | 44 | | $\frac{22}{3}$ | -20 |
| | | | -10 | | 14 | | |
| 7 | 2 | 14 | | 58 | | $\frac{58}{7}$ | -34 |
| | | | -14 | | 16 | | |
| 8 | 0 | 0 | | 74 | | $\frac{37}{4}$ | -74 |

What quantity would the monopolist choose?

3

What price would the monopolist charge consumers?

10

How much profit would the monopolist earn?

16

What would the quantity be if this were a perfectly competitive market? $MC = AVC$

4

What price would consumers pay if this were a perfectly competitive market? 8

Example using Equations:

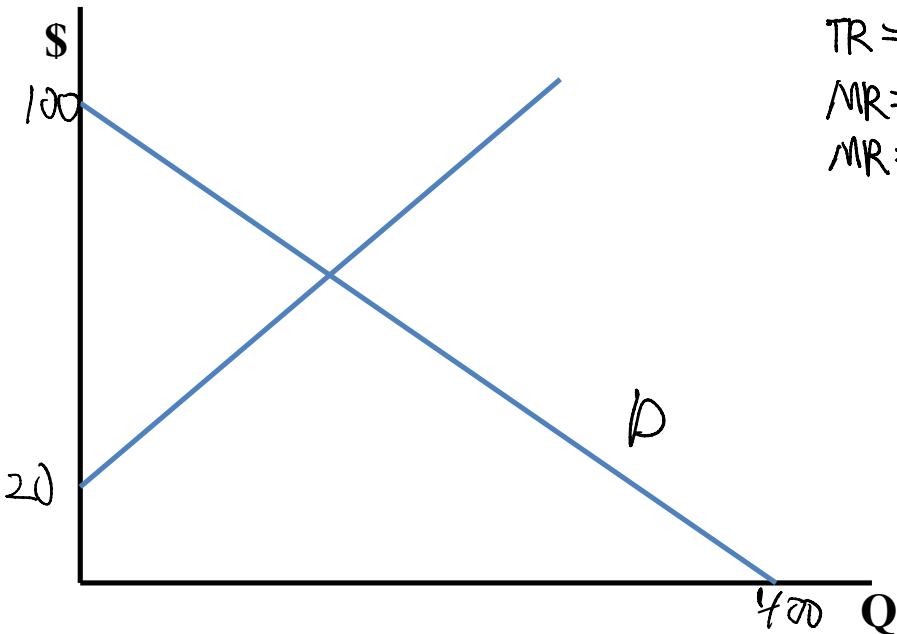
Supply: $MC = P = 20 + 0.5Q$

Demand: $P = 100 - 0.25Q$

$MR = 100 - 0.5Q$

The MR function has the same vertical intercept as the demand function, but twice the negative slope.

Graph and calculate Q^M and P^M .



$$TR = PQ = (100 - 0.25Q)Q$$

$$TR = 100Q - 0.25Q^2$$

MR = first derivative of TR

$$MR = 100 - 0.5Q$$

$$MR = MC$$

$$100 - 0.5Q = 20 + 0.5Q$$

$$Q^M = 80$$

$$P^M = 100 - 0.25 \cdot 80 = \$80$$

Use the demand function to find the *demand price*.

Exercise 2:

The following equations apply to a single-price monopolist:

Supply: $MC = 5 + 0.3Q$

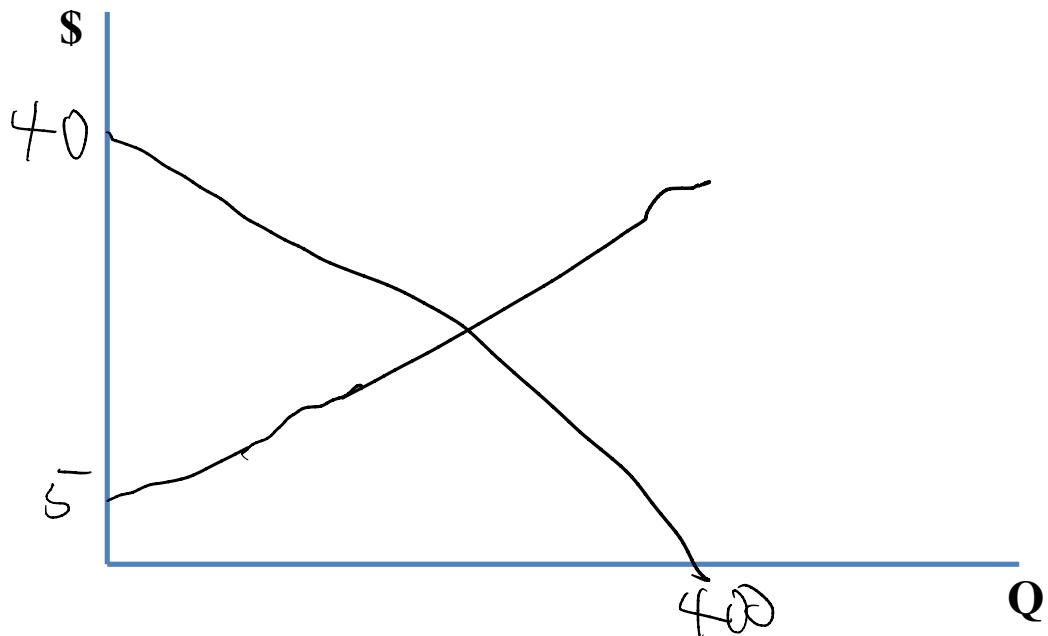
Demand: $P = 40 - 0.1Q$

$$TR = PQ = 40Q - 0.1Q^2$$

$$MR = 40 - 0.2Q$$

What is the marginal revenue function?

Graph MR, D, and MC.



Calculate Q^M and P^M and show on the graph above.

$$MR = MC$$

$$40 - 0.2Q^M = 5 + 0.3Q^M$$

$$0.5Q^M = 35$$

$$Q^M = 70$$

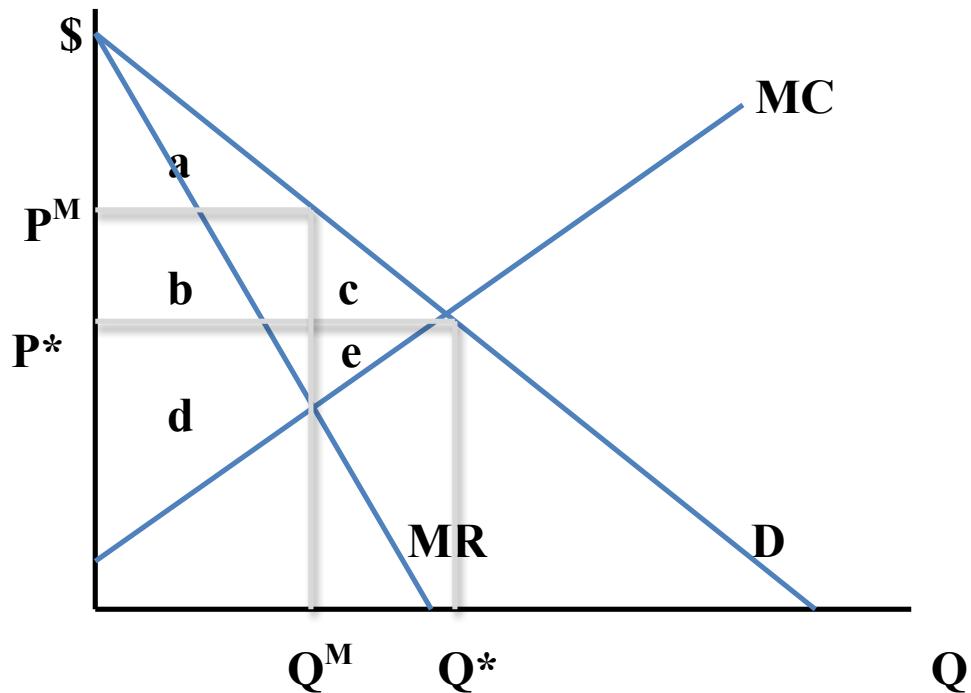
$$P^M = 40 - 0.1 \cdot 70 = \$33$$

Monopolies and Efficiency

- Consumers prefer perfectly competitive markets because Q is larger and P is lower.
- Producers would prefer to be a monopoly because they can earn economic profits in the long run.

Which market system makes society better off over all?

The *efficiency* of each market system can be analyzed using the concept of *producer and consumer surplus*.



| | CS | PS | TS | DWL |
|---------------------|-----|----|-------|-----|
| Perfect Competition | abc | de | abcde | 0 |
| Monopoly | a | bd | abd | ce |

Monopolies are inefficient because for the output between Q^M and Q^* the demand price $>$ supply price, so there are missed opportunities or deadweight loss.

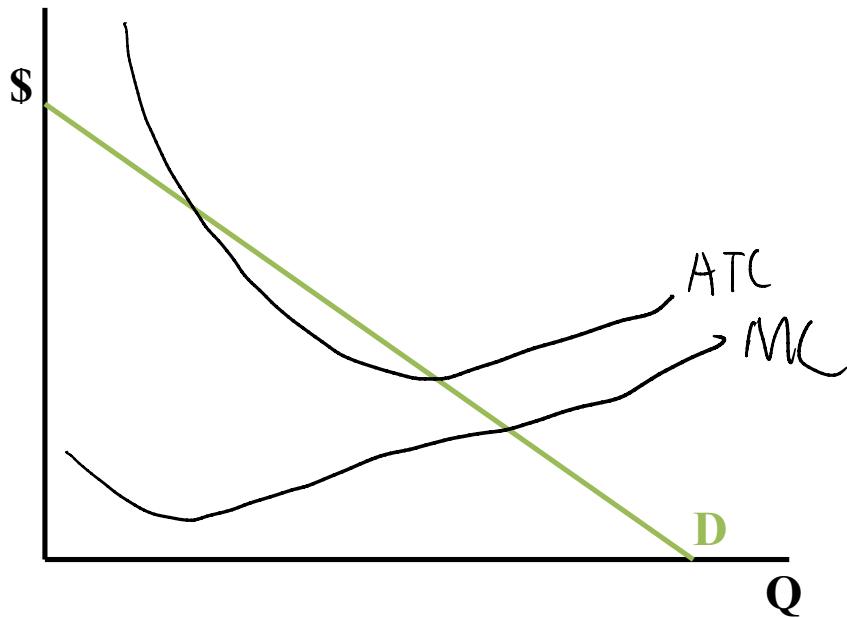
Public Policy on Monopolies

For monopolies that are not natural monopolies, the Canadian government has designed *competition policy* or *combine laws*.

- It is illegal to collude with other firms to restrict output and therefore increase prices.
- Mergers have to be approved by the *Competition Bureau*.

Natural Monopolies

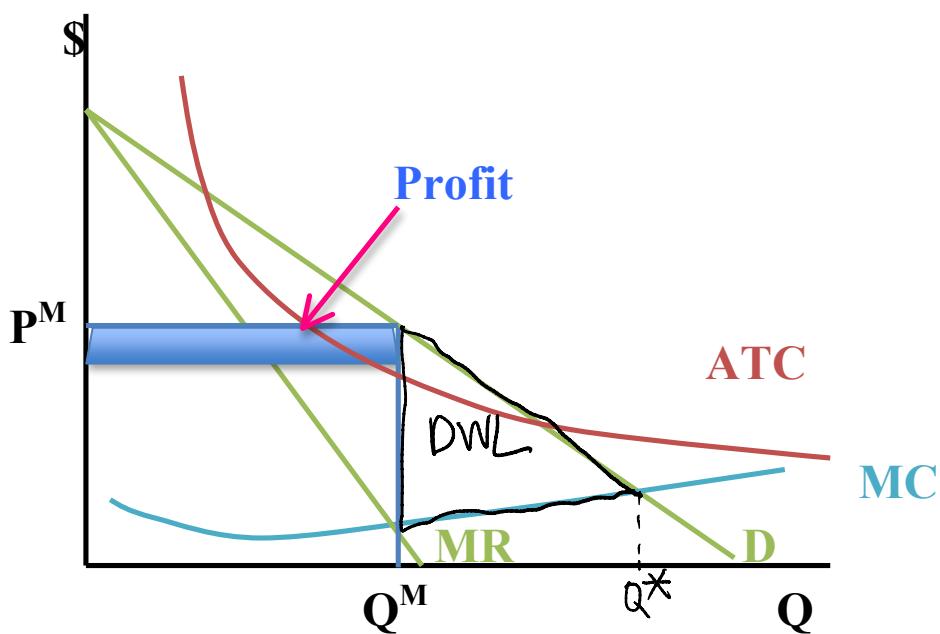
For a natural monopoly the ATC curve is downward sloping rather than U-shaped. It has no minimum point, so the MC curve never crosses the ATC curve within the relevant range of output.



For natural monopolies it is more efficient to have a monopoly since one large firm can produce the quantity demanded in the market at a lower cost than several small firms.

BUT a monopoly creates DWL:

Efficiency or total surplus is maximized when output is at the point where the $MB=MC$, or output = Q^*



For an unregulated natural monopolist:

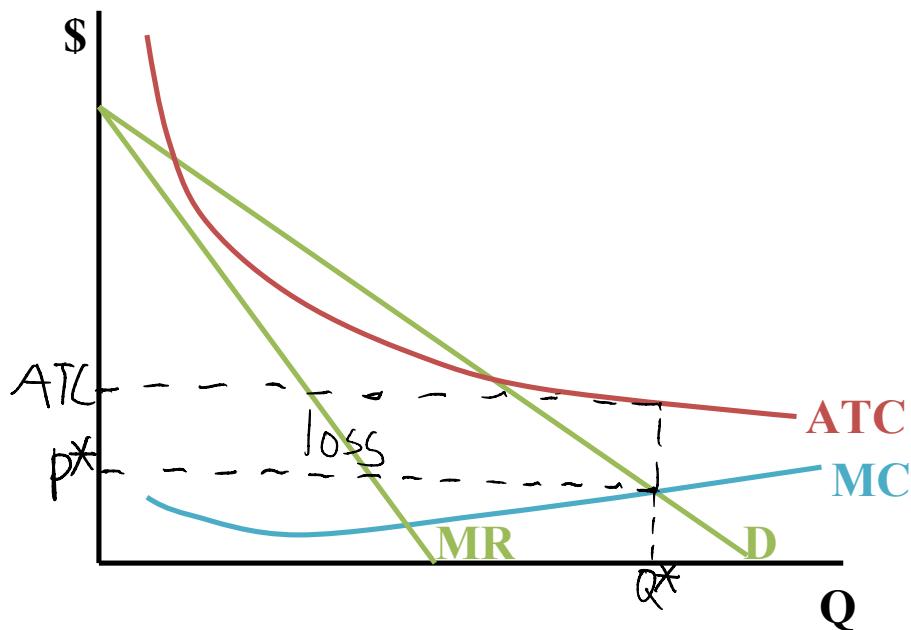
$$\text{Output} = Q^M \quad \text{Price} = P^M \quad \text{Profit} = (P^M - ATC) Q^M$$

Solution: Public ownership or price regulation

Public Ownership:

- The benefit of government ownership is that prices can be set to maximize efficiency rather than profits.

Publicly Owned Monopoly: $P = P^*$ and $Q = Q^*$



For a publically owned monopolist:

$$\text{Output} = Q^*$$

$$\text{Price} = P^*$$

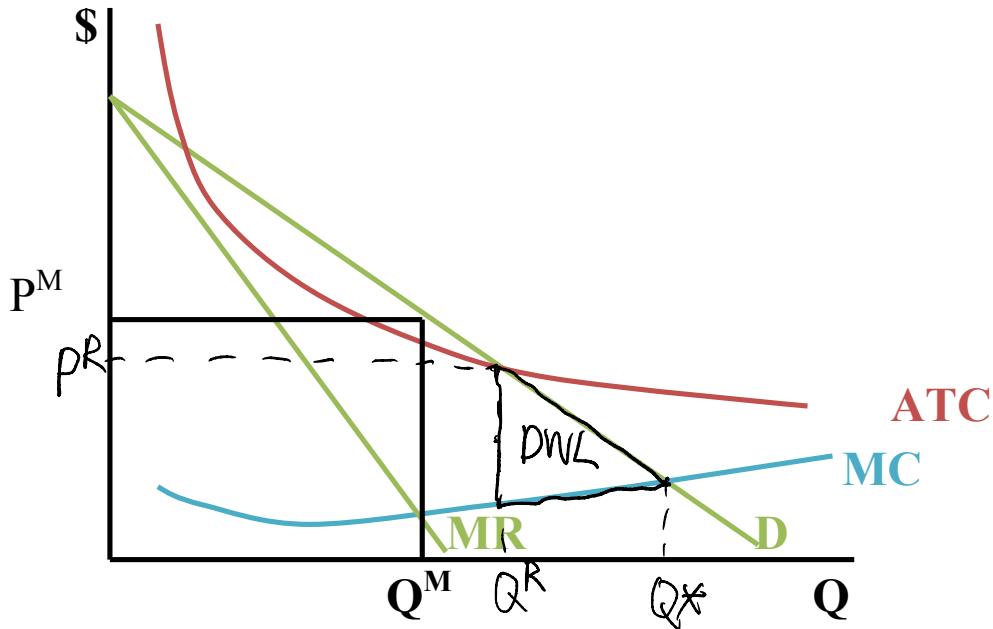
$$\text{Profit} = (P^* - ATC) \cdot Q^* \rightarrow \text{Loss}$$

A price set where $MC = D$ is socially optimal, but will not cover costs and the firm will lose money.

If the monopoly is publicly owned the government can subsidize the loss.

$$\text{Subsidy} = (ATC - P^*) \cdot Q^*$$

Price Regulated Monopoly: Price ceiling at $D = ATC = P^R$



For a price regulated natural monopolist:

$$\text{Output} = Q^R \quad \text{Price} = P^R = ATC = D$$

$$\text{Profit} = (P^R - ATC)Q^R = 0$$

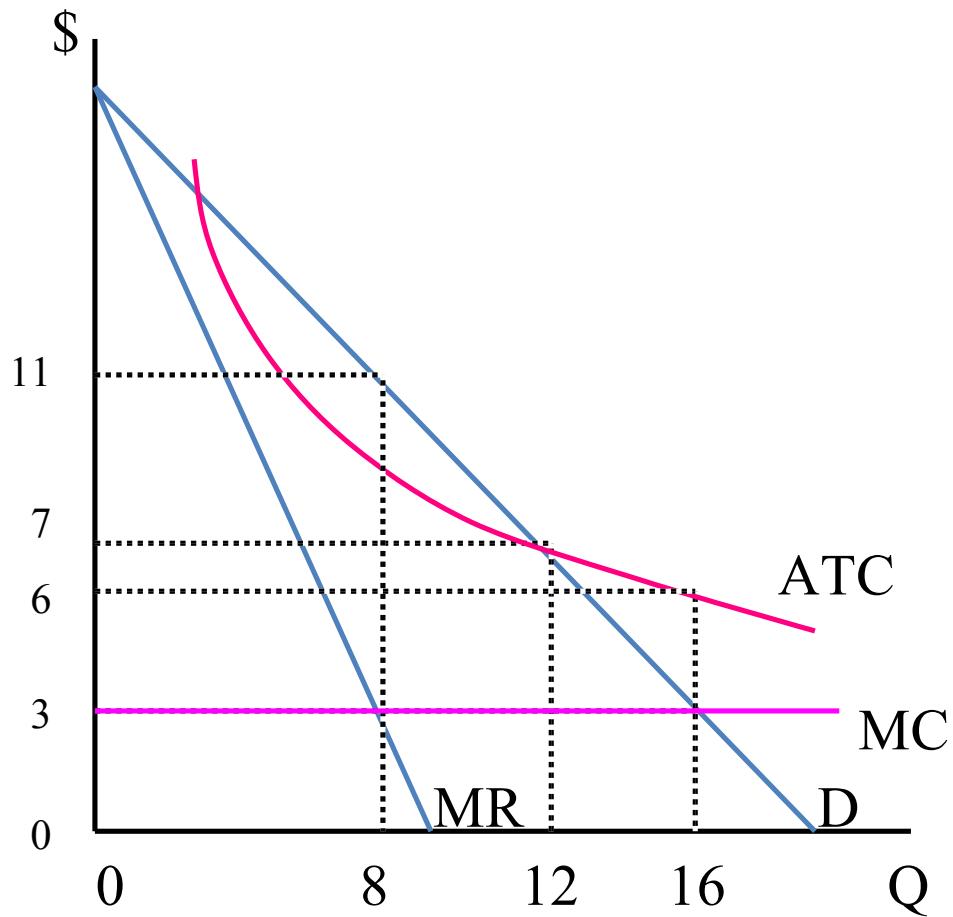
This means the firm will break even and the DWL is smaller compared to DWL with an unregulated monopolist.

This is an example of a *price ceiling* that improves market efficiency.

Examples: Translink and BC Hydro

- The only problem with public ownership and price regulation is lack of incentives to minimize costs.

Exercise 3:



If this is an unregulated monopolist what will the DWL be? $(11-3)(16-8)0.5 = \$32$

If this is a publically owned monopolist what will the DWL be? How much will the monopolist be subsidized? $DWL=0$ subsidy $= (6-3)/16 = \$48$

If this is a price regulated monopolist what will the DWL be? $DWL = (7-3)(16-12)0.5 = \8

Price Discrimination

= when a monopolist charges different prices to different groups of consumers for the same good.



Price discrimination allows for higher profit.

Monopolists can take advantage of knowledge about the different WTP of consumers.

Examples:

- Student and senior discounts
- Coupons
- Evening and weekend cell minutes
- Different prices for airline tickets booked at different times or with different arrival and departure days



Why is price discrimination more profitable?

Consumers have different willingness to pay for goods and services and have different price elasticities of demand because of differences in income, preferences, necessities

Price discrimination allows monopolists to charge higher prices to consumers with higher incomes or who are less price sensitive (more inelastic) and charge lower prices to consumers with

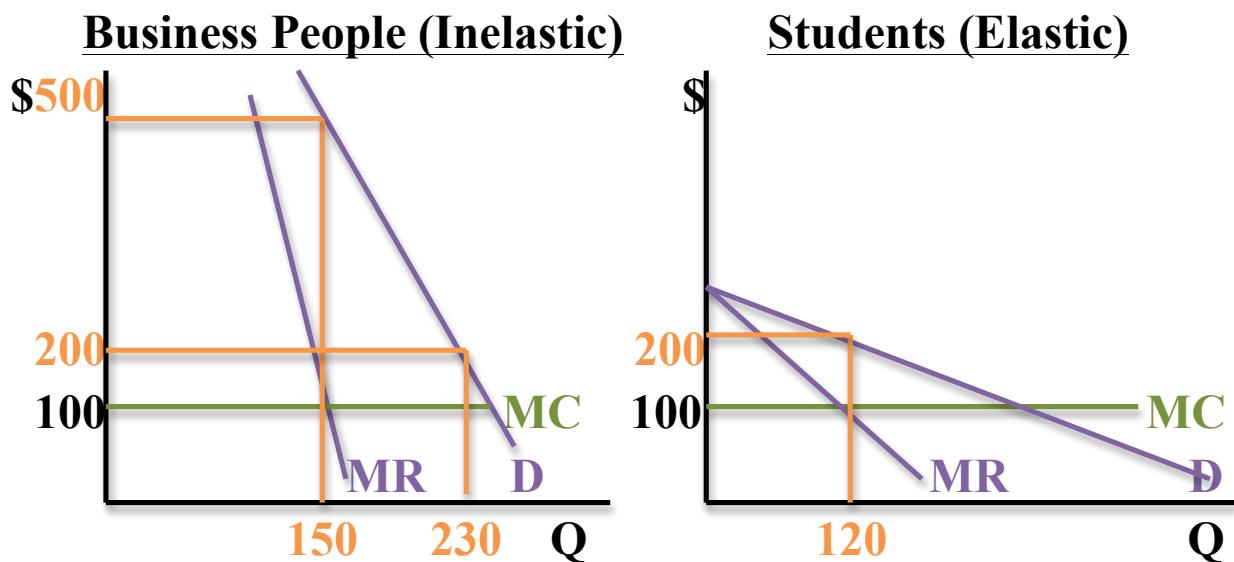
lower incomes or who are more price sensitive (more elastic).

The monopolist makes more profit by selling at higher prices to consumers with a higher WTP and selling more at lower prices to consumers with a lower WTP.

Example: Airline monopolist

MC per flight is \$100 per passenger (assume MC = ATC)

There are two groups of consumers: business people and students.



If the airline charges \$500 it will sell 150 tickets and earn profits $(500 - 100) \times 150 = \$60,000$

If the airline charges \$200 it will sell 350 tickets and earn profits $(200 - 100) \times 350 = \$35,000$

If the airline can only charge one price it should charge \$500

But if it could charge \$200 to students and \$500 to the business people, it would earn

$$60000 + (200 - 100) \times 120 = \$72,000$$

The price discrimination would work because of the different *price elasticities of demand*.

- **Business travelers have very inelastic demand**
 - Need to go on certain days
 - Need to go to a specific destination
 - High necessity to go
- **Students have very elastic demand**
 - Have more time (especially around holiday time)
 - Do not necessarily need to go
 - Willing to take alternatives such as bus, driving (for Canadian students)

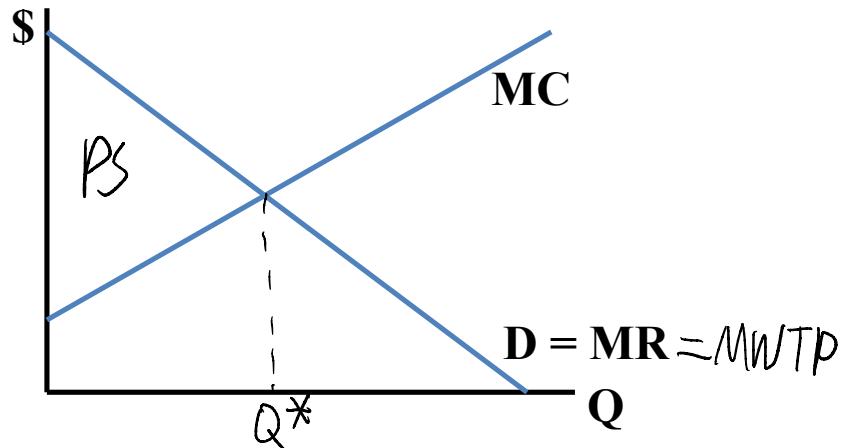
So the airline charges different prices for travel during the week (business) versus weekends (students and vacationers)

Passengers have to show ID so there cannot be any arbitrage
→ the practice of buying at a low price and selling at a high price.

Price discrimination increases consumer surplus because it gives consumers who are not willing to pay the higher price a chance to buy the good at a lower price.

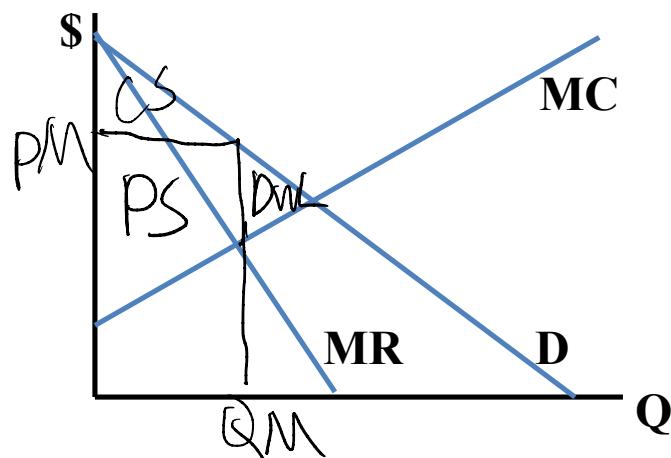
Perfect price discrimination = when a monopolist charges each consumer his/her exact WTP for each unit.

$$\text{Price} = \text{MWTP} = \text{MR}$$



There are maximum possible profits but also maximum possible total surplus.

There is no DWL with perfect price discrimination, compared to a large DWL with a single price monopolist.



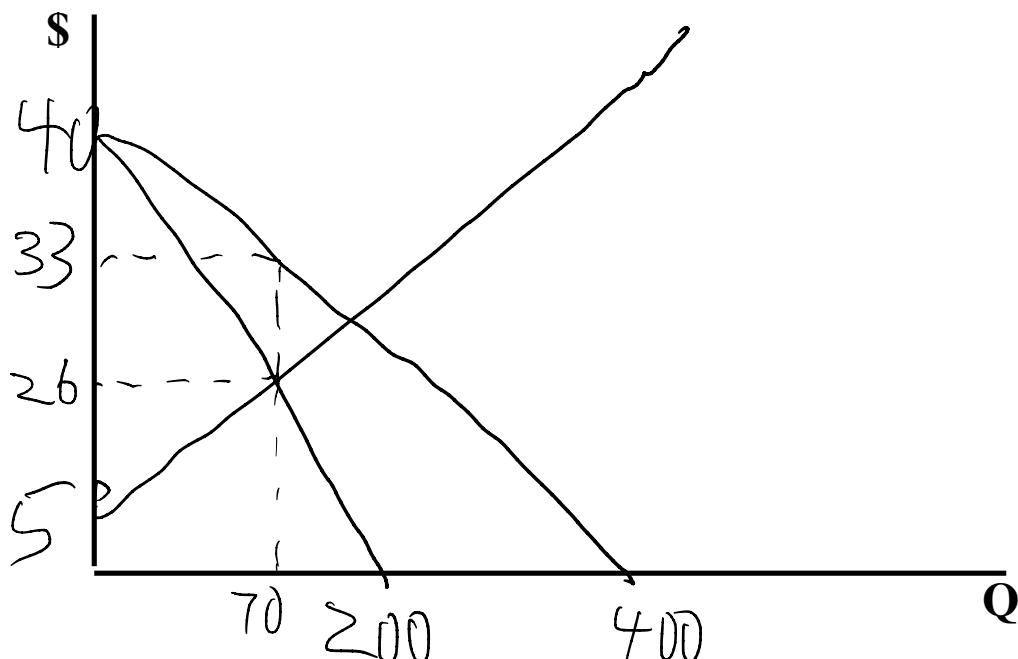
Exercise 4:

Supply: $MC = 5 + 0.3Q$

Demand: $P = 40 - 0.1Q$

$MR = 40 - 0.2Q$

Graph the MC, D, and MR functions:



If this is a single-price monopolist calculate CS, PS, and DWL.

$$5 + 0.3Q = 40 - 0.2Q$$

$$0.5Q = 35$$

$$Q = 70$$

$$40 - 0.1 \cdot 70 = 40 - 7 = 33 \quad PS: \frac{(33-5)}{70} \cdot 70 = 245$$

$$CS: (40-33) \cdot 70 \cdot 0.5 = 245$$

$$5 + 0.3 \cdot 70 = 5 + 21 = 26$$

$$\frac{70}{2} = 35$$

$$-125$$

If this monopolist can perfectly price discriminate calculate CS, PS, and DWL.

$$5 + 0.3Q = 40 - 0.1Q$$

$$0.4Q = 35$$

$$Q = 87.5$$

$$CS = DWL = 0$$

$$PS = \frac{(40-5) \cdot 87.5}{2}$$

$$= 1531.25$$

$$DWL: \frac{(33-26)(87.5-70)}{2} = 61.25$$