1 Monopoly

1.1 Recap

A monopolist is the only firm that sells a particular good.

If the inverse demand function is $p(y)$ (how much will consumers pay for output y)

$$\pi(y) = yp(y) - c(y)$$

1.2 Example

Demand: $y = 100 - p$

Cost: $c(y) = 10y$

a) Find the inverse demand:

$$p = 100 - y$$

b) Set up the monopolist's profit function in terms of y.

$$\pi(y) = y(100 - y) - 10y$$

c) Find the optimal y

$$\pi(y) = 100y - y^2 - 10y$$

$$\pi(y) = 90y - y^2$$

$$\frac{\partial\left(90y - y^2\right)}{\partial y} = 90 - 2y$$

Set this to zero to find where marignal profit is zero.

$$90 - 2y = 0$$

$$y^* = 45$$

d) What does the monopolist charge?

Plug the optimal y^* into the inverse demand.

$$p = 100 - 45$$

$$p^* = 55$$

e) What is their profit?

$$\pi(45) = 45(100 - 45) - 10(45)$$

$$= 45 * 55 - 10(45) = 45 * 45 = 2025$$

1.3 Monopoly and Elasticity

The optimal output will never occur where demand is inelastic. Demand will never be inelastic at the optimum for a monopolist.

If demand is inelastic, the monopolist can always increase profit.

If demand is inelastic a one percent increase in price will lead to less than a one percent decrease in demand.

Suppose the monopolist deceases output by 1% how much can they increase price by? They can increase their price by more than 1%.

Revenue is price times output so if you do this, **revenue has to go up** since price goes up by more than demand goes down.

Since output decreases, costs will also decrease.

Since revenue goes up and costs go down, **profit has to go up**.

This will continue until all of the inelasticity has been "used up" and demand becomes elastic.

Insight:

The insight is, when demand is inelastic you can increase price a lot without decreasing demand by much. This will increase revenue and decrease cost leading to an increase in profit.

1.4 Surplus and Deadweight Loss

2 Price Discrimination

Any time you are doing something besides charging a single unit price for everyone, you are using a form of *price discrimination*.

2.1 Types

First-Degree: You charge every person their full willingness to pay for the good. This maximizes the firms profit leaving no deadweight loss or consumer surplus.

This requires knowing everyones willingness-to-pay and being able to take advantage of that by charging every person a different price.

Examples: airlines (charge everyone a different price)

Second-Degree: The company produces different "levels", packages, qualtities, versions of basically thing and charge different prices. The key difference here is that consumers self-select into paying more.

Examples: Special-Edition Alubums, Reserve Wines, Whiskey, Trim-Levels of Cars, Iphone "pro", Concert ticket (location to stage), club-level sports tickets, "high" vs "regular" insurance from the same company,

Third-Degree: The company can identify different **groups** and charge them different amounts.

Examples: Student ticket pricing, Senior-citizen pricing, Educational software discounts,

2.2 Specialized Forms

Bundling: When a company sells multiple differents kind of products, they force you to buy them in a bundle and do not make the individual products available for purchase.

Exampels: TV Channels, Microsoft Office

Two-Part Tariff: When a company sells something that consumers tend to demand multiple of, they sell the good at a low unit price (maybe free) but charge a membership or acess fee to capture consumer surplus.

Examples: Amusment park tickets, free coffee for a month with a $20 mug.

2.3 Third-Degree

A company sells concert tickets.

Students demand: $y_s = 100 - 2p$

Non-Students: $y_n = 100 - p$

Total market demand: $y = y_s + y_n = 100 - 2p + 100 - p = 200 - 3p$

Assume costs are zero: $c(y) = 0$

2.3.1 One price for everyone (no price discrimination).

Demand function $y = 200 - 3p$

Inverse demand: $p = \frac{200}{3} - \frac{1}{3}y$

$$\pi(y) = y\left(\frac{200}{3} - \frac{1}{3}y\right) = \frac{200}{3}y - \frac{1}{3}y^2$$

Maximize this:

$$\frac{\partial\left(y\left(\frac{200}{3}y - \frac{1}{3}y^2\right)\right)}{\partial y} = \frac{200}{3} - \frac{2}{3}y$$

$$\frac{200}{3} - \frac{2}{3}y = 0$$

$$100 = y^*$$

What price should they set to sell 100 tickets (if they charge everyone the same price).

Plug $y = 100$ into the inverse demand for the entire market:

$$\left(\frac{200}{3} - \frac{1}{3}100\right) = \frac{200}{3} - \frac{100}{3} = \frac{100}{3} \approx 33.33$$

Profit they get is:

$$\pi(100) = 33.33\,(100) = 3333.33$$

2.3.2 Profit for Student

$y_s = 100 - 2p$

Student inverse demand is $p = 50 - \frac{1}{2}y_s$

Profit function in the student market:

$$\pi(y_s) = y_s\left(50 - \frac{1}{2}y_s\right)$$

$$= 50y_s - \frac{1}{2}y_s^2$$

$$\frac{\partial\left(50y_s - \frac{1}{2}y_s^2\right)}{\partial y_s} = 50 - y_s$$

$$50 - y_s = 0$$

$$y_s = 50$$

Plug this into the student inverse demand to get the price you can charge them:

$$p_s = \left(50 - \frac{1}{2}50\right) = 25$$

$$\pi\left(25\right) = 50 * 25 = 1250$$

2.3.3 Market for Non-Students

Inverse deamnd: $p = 100 - y_n$

a) Find the profit function for non-students tickets.

$$\pi\left(y_n\right) = y_n\left(100 - y_n\right)$$

$$= 100y_n - y_n^2$$

b) Find the optimal y_n

$$\frac{\partial\left(100y_n - y_n^2\right)}{\partial y_n} = 100 - 2y_n$$

$$100 - 2y_n = 0$$

$$y_n^* = 50$$

c) What price should they charge non-students p_n

Plug this into the inverse demand for non-students:

$$p_n^* = 100 - 50 = 50$$

d) What is their profit?

$$\pi(50) = 50(50) = 2500$$

Total profit is $1250 + 2500 = 3750 > 3333.33$

2.3.4 Bundling

	Shirt	Pants	Both
Consumer 1	50	30	80
Consumer 2	10	80	90

2.3.5 Two-Part Tariff

Demand for each consumer: $y = 10 - p$. Cost is zero.