1 Monopoly

1.1 Recap

A monopolist is the only firm that sells some particular good. The way the price they can charge p is related the amount they choose to sell y is through the inverse demand.

Inverse demand is the most that consumers would pay to buy y units of a good.

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

1.2 Example

Demand: $y = 100 - p$

Cost: $c(y) = 10y$

a) Find the inverse demand function:

Inverse demand:

$$y = 100 - p$$

$$p = 100 - y$$

b) Set up the profit function for the monopolist:

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

$$y(100 - y) - 10y$$

c) Find the optimal y to maximize profit:

$$\frac{\partial(y(100 - y) - 10y)}{\partial y} = \frac{\partial\left(100y - y^2 - 10y\right)}{\partial y} = \frac{\partial\left(90y - y^2\right)}{\partial y}$$

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

Where is marginal profit zero?

$$90 - 2y = 0$$

$$y^* = 45$$

d) What does monopoly charge?

Plug $y = 45$ into the inverse demand:

$$p^* = 100 - 45 = 55$$

e) What is the profit they get?

Plug $y = 45$ into the profit function:

$$\pi(45) = 55 * 45 - 10(45)$$

$$\pi(45) = 2025$$

1.3 Monopoly and Elasticity

1.4 Markup

1.5 Checking Markup

Suppose $\epsilon = -2$ and $c(y) = 10y$ so mc is constant at 10. What does the monopolist charge?

Suppose $\epsilon = -1.5$ and $p = 100$ what is their marginal cost?

1.6 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 Price Discrimination: Everyone pays their full willingness to pay. Every consumer is **identified** and charged a different price.

Examples: Airlines are kind of close (everyone pays a different price). Uber using algorithms to chrge prices (kind of close).

Second-Degree Price Discrimination: You can't identify any individual consumers but you can offer different, packages, levels, or qualitites, and let the consumers pick for themselves. **Options that people self-select into.**

Examples: Coach/Buisness Class on Airlines, Whiskey/Wine Levels, How close you are to the stage at a concert, club seats at a baseball game. Different lines withint the same company (luxury vs. regular clothing). Special edition albums/games.

Third-Degree Price Discrimination: Identify different **groups** and charge them different prices depending on the specifics of that group's demand. Different groups are forced to buy at different prices.

Examples: Student ticket discount, ederly discounts, Educational discounts on software.

2.2 First-Degree

In first-degree price discrimination, you charge everyone the maximum willingness to pay instead of a single price for everyone.

Thre consumer are willing to pay \$3, \$2, and \$1 respectively.

If you charge a different price to everyone you can earn \$6.

Suppose you charge the same price to everyone.

Price	# Buyers	Profit
\$1	3	\$3
\$2	**2**	**\$4**
\$3	1	\$3

2.3 Third-Degree

Suppose costs are zero.

Students $y_s = 100 - 2p$,Invserse demand $p = 50 - \frac{1}{2}y_s$

Non-students $y_n = 100 - p$, Inverse demand $p = 100 - y_n$

Combined $y = (100 - 2p) + (100 - p) = 200 - 3p$,

Combined inverse demand: $3p = 200 - y$, $p = \frac{200}{3} - \frac{y}{3}$

2.3.1 One price for everyone

Chrge one price for everyone. Don't treat the groups differently:

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

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

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

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

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

$$y^*=100$$

To find the price, plug this back into the combined inverse demand:

$$p=\left(\frac{200}{3}-\frac{100}{3}\right)=\frac{100}{3.0}\approx 33.33$$

$$\pi\left(\frac{100}{3}\right)=100\left(\frac{100}{3}\right)\approx 3333.33$$

2.3.2 Profit for Student

Profit function for students. Try to setll y_s units to the students:

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

$$\frac{\partial\left(50y_s-\frac{1}{2}y_s^2\right)}{\partial y_s}0$$

$$50 - y_s = 0$$

$$y_s = 50$$

Plug this back into the student inverse demand to get their price:

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

Profit in the student market:

$$\pi(y_s) = 50 * 25 = 1250$$

2.3.3 Market for Non-Students

Inverse demand $p_n = 100 - y_n$.

a) Set up the profit function.

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

b) find optimal y_n

$$\frac{\partial\left(100y_n - y_n^2\right)}{y_n} = 0$$

$$100 - 2y_n = 0$$

$$y_n = 50$$

c) determine what price to chrge non-students

Plug this optimal y_n into the non-student inverse demand:

$$p_n = 100 - y_n$$

$$p_n = 50$$

d) find the profit earned in this market.

$$\pi\left(y_n\right) = 50 * 50 = 2500$$

What is to total profit of selling to the groups separately?

$$\pi_s = 1250$$

$$\pi_n = 2500$$

$$\pi_s + \pi_n = 3750$$

The profit from combining the groups:

$$\pi = 3333.33$$

2.4 Bundling

Bundling can happen when a firm sells multiple types of products where the demand for those products might be complementary.

Force consumers to buy the bundle.

Example: Television Packages, Microsoft Office

Suppose costs are zero.

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

Price pants and shirts.

What price should we charge for shirts to maximize profit?

Shirts:

Try to sell to both:

Charge \$10. Sell two shirts. \$20 profit.

Try to sell to one:

Charge \$50. Sell one shirt. \$50 profit.

Pants:

Try to sell to both:

Charge $30. Sell two pants. $60 profit.

Try to sell to one:

Charge $80. Sell one pants. $80 profit.

Bundle

Try to sell to both:

Charge $80. Sell two outfits. $160 **profit.**

Try to sell to one:

Charge $90. Sell one outfits. $90 profit.

2.5 Two-Part Tariff

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