Lecture 11
Pricing III: Price Discrimination & Market Segmentation

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**15.011/0111 Economic Analysis for Business Decisions**
Oz Shy

Reminder: Two different ways of interpreting demand functions

One consumer: If P=$140, she buys nothing, P=$120 she buys 5 units, P=$80 she buys 15 units, and so on...

Many consumers, each buys 1 unit (aggregate demand curve): If P=$140, no one buys,
P=$120, 5 consumers enter the market,
P=$80, 15 consumers enter the market, and so on...

Demand Schedule

P	Q_d (thousands)
$140	0
$120	5
$100	10
$80	15
$60	20
$40	25
$20	30
$0	35

Market Demand Curve
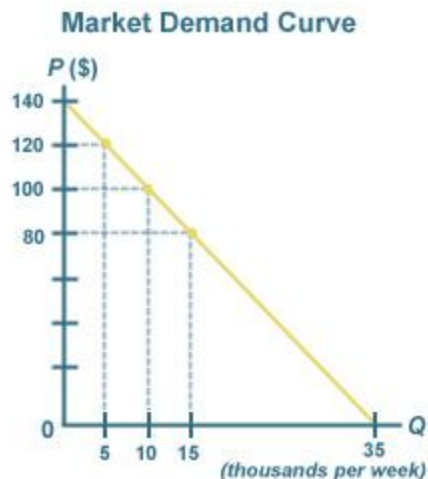
Why is price discrimination profitable?

1. Consumers have different willingness to pay (caused by having different tastes for products/services, different income levels, etc.)
2. Setting a uniform price to all consumers regardless of their willingness to pay
   - forgoes the opportunity of extracting more from consumers with high willingness to pay
   - and may exclude participation of consumers with low willingness to pay

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Dogs have lower willingness-to-pay than men

Dr. Leonard's
AMERICA'S LEADING ONLINE HEALTHCARE CATALOG

Barber Magic Trim-A-Pet™

Give your pet the perfect haircut with this safe, easy-to-use precision trimmer. Just adjust the blade for the proper length, and this precision pet grooming tool will trim, taper and style any length hair just like a pro. These pet products quickly get out burrs, mats and tangles, too.

Ideal for dogs, cats, horses and other long-haired pets. No batteries or electricity needed - no frightening noise or vibrations to ensure safe pet care.

$7.99

Dr. Leonard's
AMERICA'S LEADING ONLINE HEALTHCARE CATALOG

Barber Magic

Now you can give yourself and your family a safe, easy haircut at home. Just adjust the blade for the proper length, and this precision haircutting tool will trim, taper and style any length hair like a pro!

Ideal for men and women, it will save you hundreds of dollars a year on expensive haircuts. No batteries or electricity needed for these hair care products.
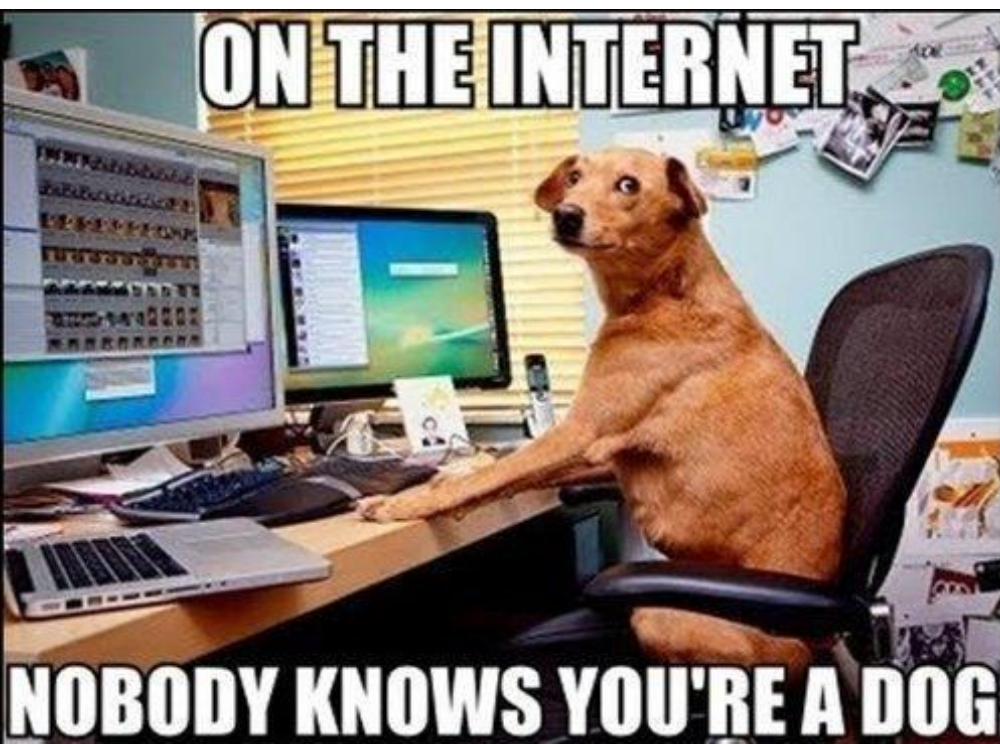
$12.99

4
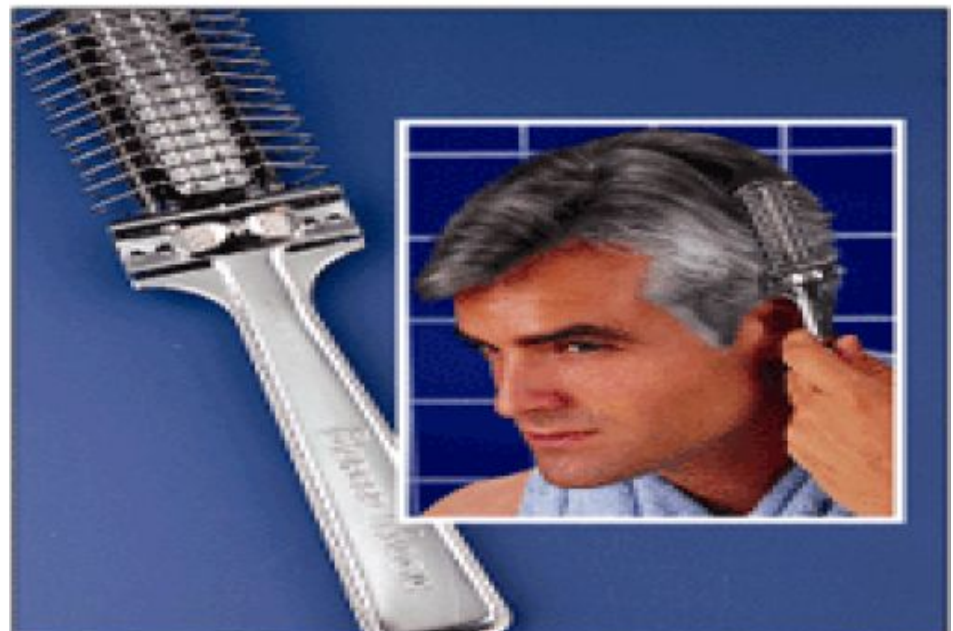
Speaking of dogs…
What's wrong with the following statement:
"On the Internet, nobody knows you're a dog"

1. Amazon's cookies observe that you spend a long time browsing over dog food and dog clothes
2. Your Facebook friends refer to you that way

ON THE INTERNET

NOBODY KNOWS YOU'RE A DOG

"On the Internet, nobody knows you're a dog."

Strategic pricing options

1. Perfect (1st-degree) price discrimination (ideal for the seller): Each consumer pays her maximum willingness-to-pay price
2. Set prices based on observable consumer characteristics (student discount, senior citizens) [3rd-degree]
3. Set prices that will induce consumer to self-select according to their willingness to pay (delay in service, class options) [also 3rd-degree PD]

   Other wisely-observed options:
   - Bundling (quantity discount: Buy one get one "free") [2nd-degree price discrimination]
   - Tying (buy a laptop and get a "free" T-shirt)
   - Two-part tariff (membership fee + per-unit price)

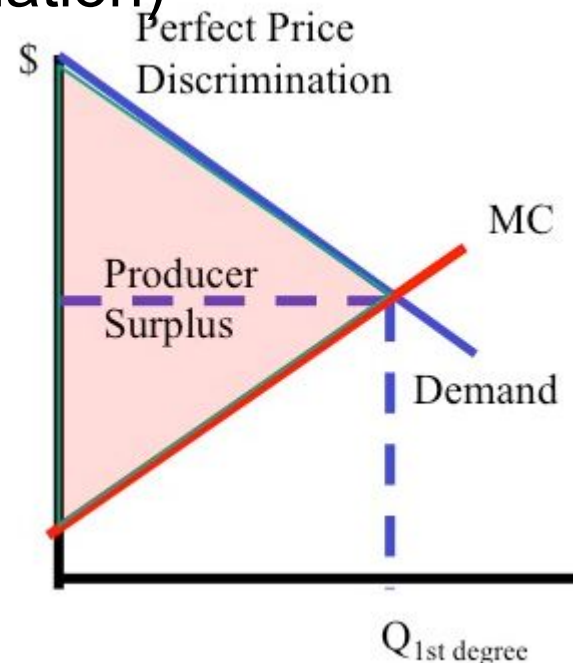# Perfect (1st-degree) price discrimination versus regular monopoly

Regular Monopoly: Sets a single price, fails to extract all surplus from high-valuation consumers, excludes low-valuation consumers

Perfectly-discriminating monopoly: Sets different a price to each consumer, extracts all the surplus from each consumer (often referred to as 1st degree price discrimination)
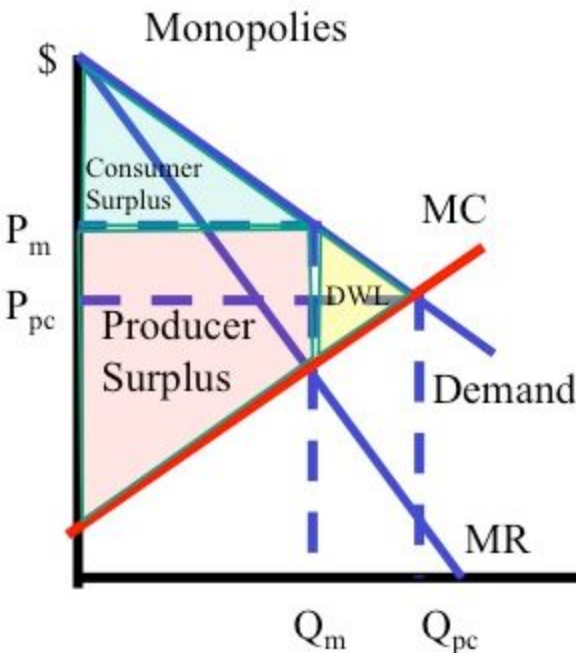
Note: Efficient outcome b/c output level is the same as under perfect competition

Examples: Tuition (income-based)

Perfect price discrimination versus regular monopoly: Example (many consumers)
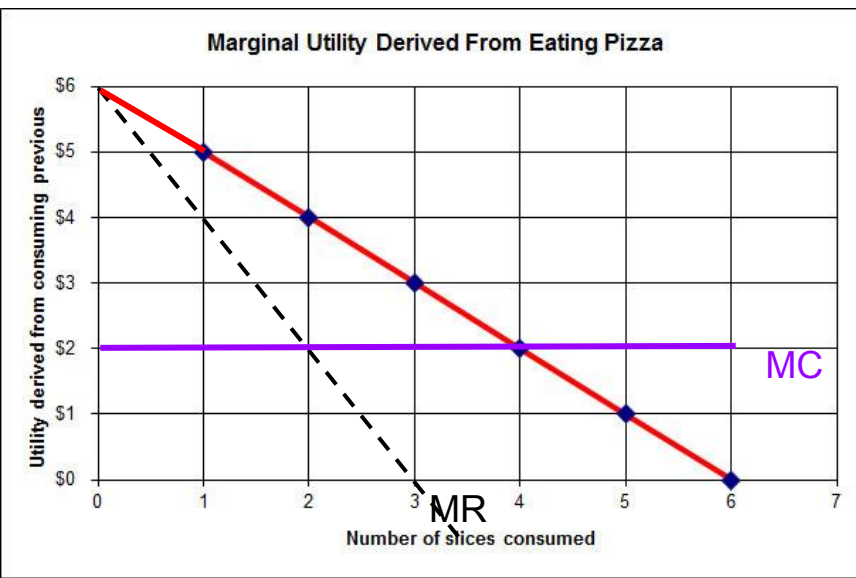
Inverse demand: $P = 6 - Q$

Seller's total cost: $TC(Q) = 3 + 2Q$, hence $MC(Q) = \$2$

Solving for a <u>regular monopoly's</u> profit-maximizing output:

$MR(Q) = MC(Q)$ implies $6 - 2Q = 2$, hence $Q^m = 2$ units & $P^m = \$4$

Long-run profit $= \prod^M = (\$4 - \$2)2 - 3 = \$1$

Marginal Utility Derived From Eating Pizza

<u>Perfectly-discriminating monopoly</u>: Will produce $Q^{PD} = 4$ units (where P=MC).

Each consumer pays a *different* price

$\prod^{PD} = (\$6 - \$2)4/2 - 3 = \$5 > \$1 = \prod^M$

= area of the triangle $\Delta(\$6, \$2, 4)$ less than fixed cost

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Perfect price discrimination (con'd): Two-part tariff: Example (one consumer type)

- Tariff consists of: a fixed fee + per-unit fee (price)
- So, the consumer pays F + P Q
- To extract the entire consumer surplus, this monopoly should set F = ($6 - $2) 4/2 = $8, and P = $2
- Total profit = $8 + ($2-$2) 4 - $3 = $5
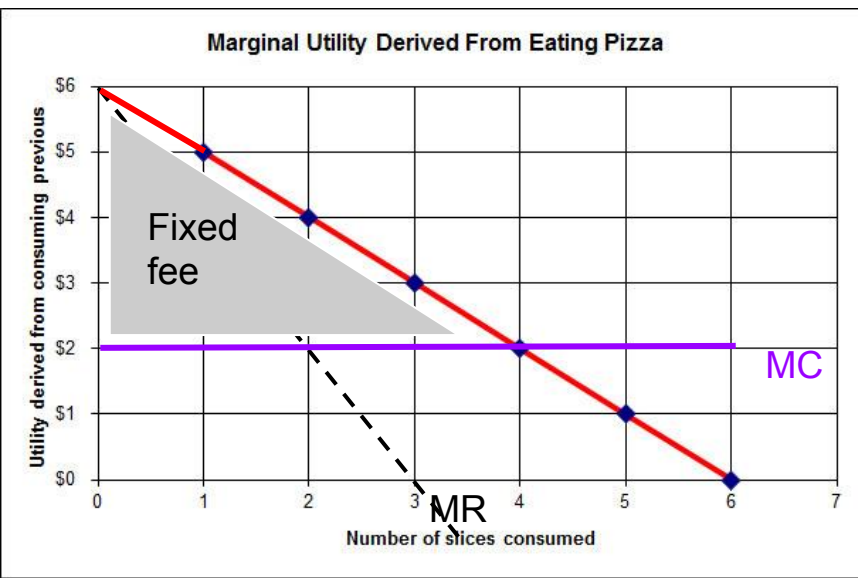
Two-part tariffs are often observed in:

- Amusement parks (entrance fee + pay-per-ride
- Club membership
- Patent licensing
- Franchises

Marginal Utility Derived From Eating Pizza

Fixed fee

MC

MR

Number of slices consumed

Utility derived from consuming previous

Why is market segmentation needed?

1. Just setting 2 prices (for all consumers) cannot enhance profit b/c all consumers will choose the lower price option
   Example: Setting p^H=\$2 and p^L=\$1 for the same good, all consumers will choose to pay p^L=\$1 [thereby making p^H irrelevant]

2. A market segmentation strategy would
   - prevent high willingness-to-pay consumers from selecting the lower price option

   - while allowing low willingness-to-pay consumers to select the low-price option
     Examples to be discussed in class: Student discount, "damaged goods" (delay in delivery, removal of options), senior discount, advance purchase, economy versus business class)

Market segmentation: Observations (auto prices in Europe before the European Union)

Italian demand is least elastic (therefore higher auto prices)
British demand is the most elastic (therefore lower auto prices)

Estimated Average Price Elasticities: France –5.6, Italy –4.0, UK –6.0		
Relative Prices	**Predicted**	**Actual**
P_F / P_{UK}	1.02	1.05
P_I / P_{UK}	1.12	1.14
P_I / P_F	1.09	1.08

Market segmentation: Observations

Restricted tickets means: Saturday night stay, non-refundable, advance purchase, etc (generally purchased by low-valuation consumers.
Source: Puller & Taylor Journal of Economic Behavior & Organization (2012)

Mean Fare by Day-of-Week of Purchase for "Restricted" Tickets
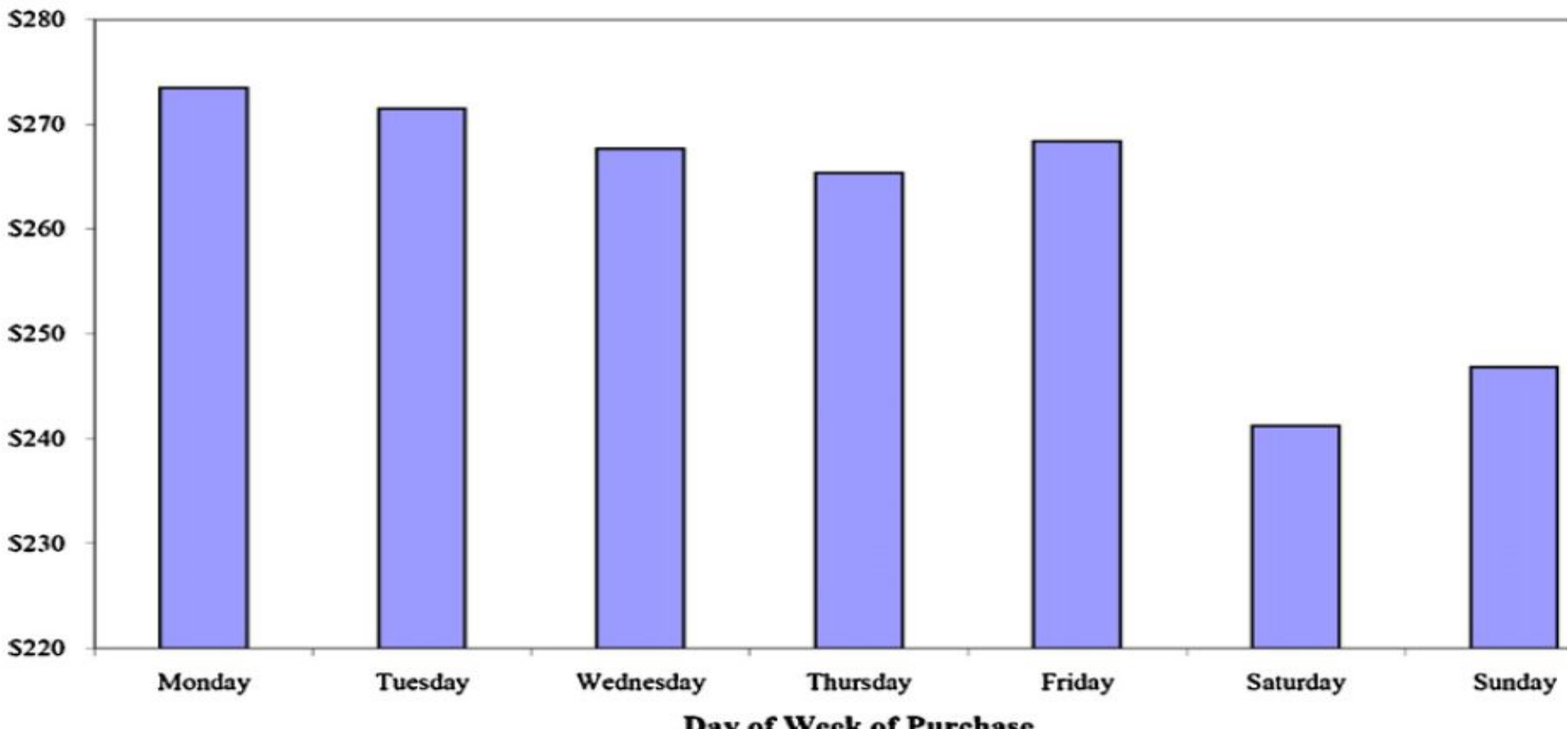
Market segmentation: Observations (con'd)

Bank of America

**Bank of America 1yr CD Rates
Less than $10,000**

Please tell us where you bank so we can give you information for your state.

Select: Your State ▼ [Go]

Place	Rate
California	1.49
Nevada	1.39
Florida	1.24
Washington	1.15

Source: BankofAmerica.com

Market segmentation: Observations (con'd): Ethical issues may emerge

Gilead to Allow Cheaper Hepatitis C Drug in Developing Countries

Sept. 15, 2014

THE WALL STREET JOURNAL.

Gilead said it would charge $300 for a bottle of the pills in India, … patients in developing countries would pay $10 a day or less for Sovaldi, about 1% of the price that many patients in the U.S. are charged.

In the U.S., a 12-week-supply costs $84,000, which some critics say is too high for a lifesaving drug…

(3rd-degree) price discrimination and market segmentation: Observable characteristics

Key assumption: No arbitrage (consumers cannot buy in the low-price market and resell in the high-price market)

Example: Student ID required, senior-citizen ID required, so markets are segmented
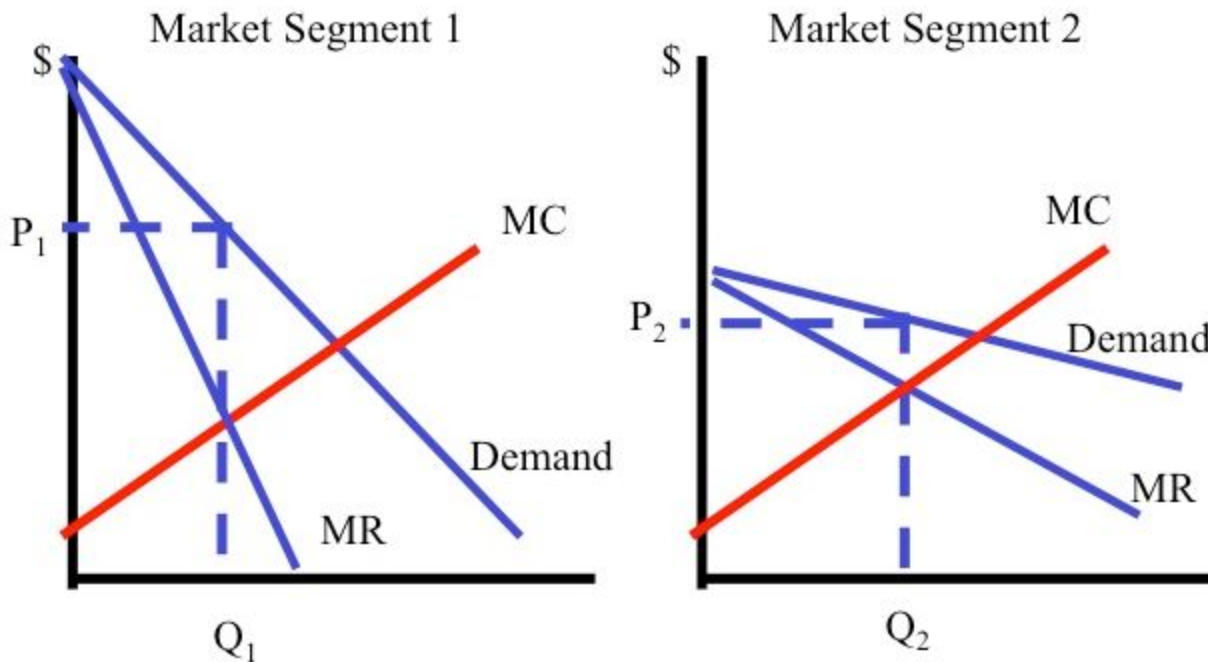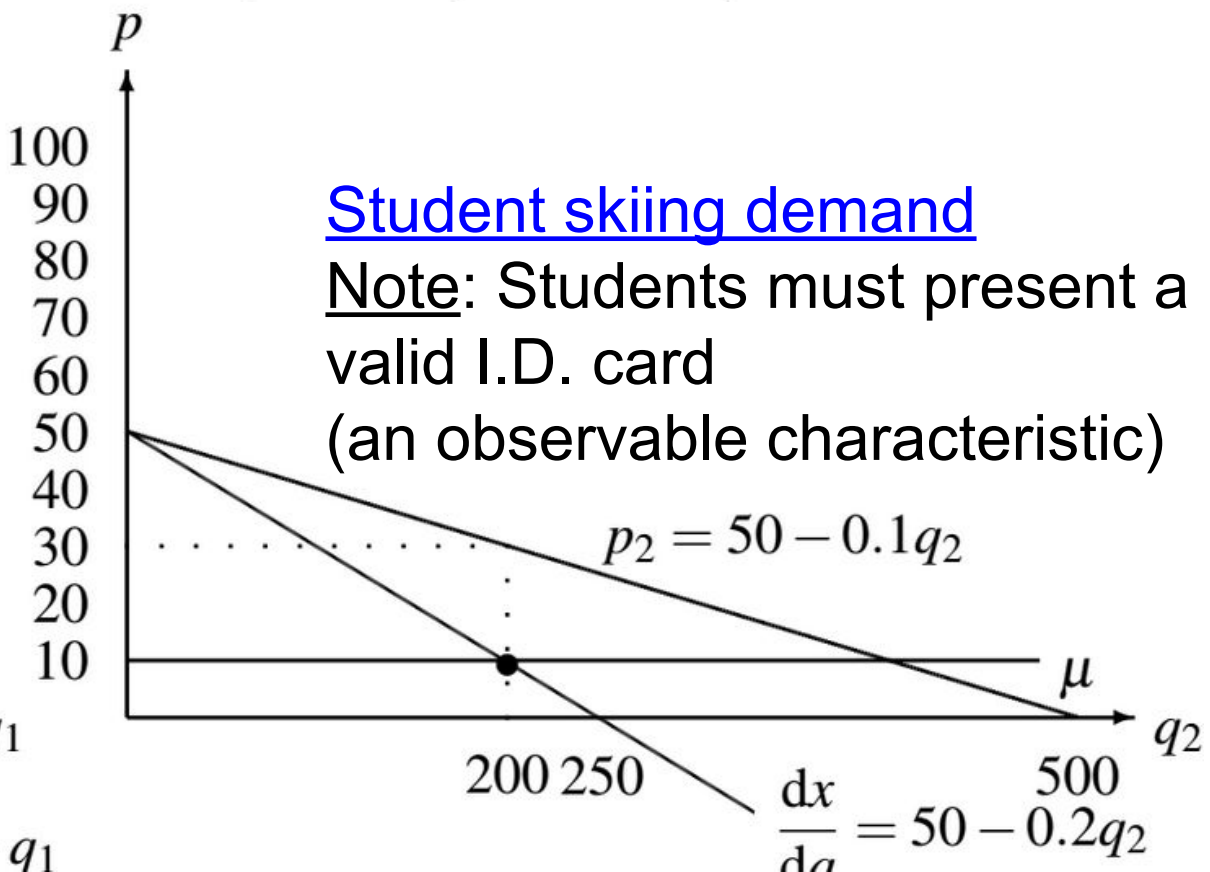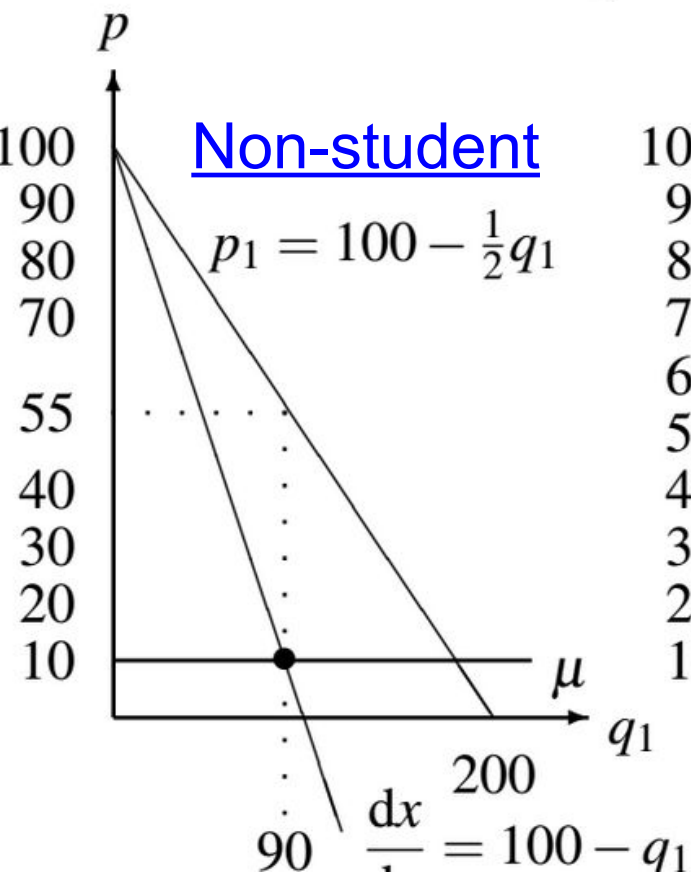
Solution: Monopoly produces where MR (Q) = MC(Q) and sets a different price on each demand curve

Note: The monopoly's price is higher in the market with the less-elastic demand

Market Segment 1

Market Segment 2

(3rd-degree) price discrimination and market segmentation: Numerical example (ski resort)

$$MR_1(q_1) = 100 - q_1 = MC = \$10 \Rightarrow q_1 = 90 \Rightarrow p_1 = \$55$$
$$MR_2(q_2) = 50 - 0.2q_2 = MC = \$10 \Rightarrow q_1 = 200 \Rightarrow p_2 = \$30$$
$$\Pi = (55 - 10)90 + (30 - 10)200 - \text{fixed cost}$$

Non-student

$$p_1 = 100 - \tfrac{1}{2}q_1$$

$$\frac{dx}{d} = 100 - q_1$$

Student skiing demand
Note: Students must present a valid I.D. card
(an observable characteristic)

$$p_2 = 50 - 0.1q_2$$

$$\frac{dx}{dq} = 50 - 0.2q_2$$

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Suppose the company's economists cannot provide you with demand data, but can provide you with known demand elasticities: $E_1 = -1.22$ and $E_2 = -1.5$. Using the markup formula:

$$\frac{p_1 - 10}{p_1} = \frac{1}{1.22}$$

$$p_1 = 100 - \tfrac{1}{2}q_1$$

$$\Rightarrow p_1 \approx \$55.45$$

$$\frac{p_2 - MC_2}{p_2} = \frac{p_2 - 10}{p_2} = \frac{1}{1.5}$$

$$\Rightarrow p_2 = \$30$$

$$p_2 = 50 - 0.1q_2$$

$$\frac{dx}{dq} = 100 - q_1$$

$$\frac{dx}{dq} = 50 - 0.2q_2$$