AP Microeconomics: Exam Study Guide

Format: 60 MC questions worth 66.67% of total. 70 minutes to answer

- 20 questions are definitional

Example: The unemployment rate measures the percentage of

(A) people in the labor force who do not have jobs
(B) people in the labor force who have a part-time job but are looking for a full-time job
(C) people who do not have jobs and have given up looking for work
(D) people in the adult population who do not have jobs
(E) people in the adult population who have temporary jobs

- 20 questions are analytical (require two step process to solve)

Example: If a commercial bank has no excess reserves and the reserve requirement is 10 percent, what is the value of new loans this bank can issue if a new customer deposits $10,000?

(A) $100,000
(B) $90,333
(C) $10,000
(D) $9,000
(E) $1,000

- 20 questions are synthesis questions (require two or three thought processes to solve)

Example: Leather and beef are jointly produced such that an increase in the production of one results in an equal increase in the production of the other. An increase in the demand for leather will most likely cause

(A) a decrease in the price of leather
(B) a decrease in the price of beef
(C) a decrease in the equilibrium quantity of beef sold
(D) an increase in the demand for beef in the short run
(E) an increase in the supply of leather

Three Free Response Questions worth 33.33% of total grade. 10 minutes of preparation time (used to sketch possible graphs and take notes) and 50 minutes to answer.

- #1: Long FRQ – should take approximately 25 minutes to answer
- #2 and 3: Short FRQs – should take approximately 12.5 minutes each to answer.

Formula Chart – AP Microeconomics

Unit 2 – Supply and Demand

Total Revenue = price x quantity

Total revenue test
P↑ and TR↓ then demand elastic
P↑ and TR↑ then demand inelastic
P↓ and TR↑ then demand elastic
P↓ and TR↓ then demand inelastic

Coefficient of price elasticity of demand:

$$\frac{\% \Delta \text{ quantity demanded}}{\% \Delta \text{ price}}$$

Coefficient > 1 = elastic demand
Coefficient < 1 = inelastic demand
Coefficient = 1 = unit elastic demand
Coefficient = ∞ = perfectly elastic demand
Coefficient = 0 = perfectly inelastic demand

Cross elasticity of demand: comparing 2 items:

$$\frac{\% \Delta \text{ quantity of } 1^{st} \text{ item}}{\% \Delta \text{ price of } 2^{nd} \text{ item}}$$

Cross elasticity coefficient positive = items substitute for each other
Cross elasticity coefficient negative = items complement each other

Income elasticity of demand: $\frac{\% \Delta \text{ quantity}}{\% \Delta \text{ income}}$

Income elasticity coefficient positive = normal good
Income elasticity coefficient negative = inferior good

Supply elasticity: $\frac{\% \Delta \text{ quantity supplied}}{\% \Delta \text{ price}}$

Tax Revenue = (Price w/tax – price seller receives) x Quantity

Utility maximization rule
$\frac{\text{Marginal Utility of Good A}}{\text{Unit cost of A}} = \frac{\text{Marginal Utility of Good B}}{\text{Unit cost of B}}$

Unit 3 – Production Markets

Revenue:

Total Revenue = price x quantity

Average Revenue = $\frac{TR}{Q \text{ output}}$

Marginal Revenue = $\frac{\Delta TR}{\Delta Q \text{ output}}$

TR @ maximum when MR goes negative

In perfect competition, MR = price (demand) for individual sellers
In perfect competition, individual seller price = market price (price taker)
In imperfect competition, MR < price (Demand)
In imperfect competition, individual seller IS THE MARKET (price maker)

Cost:

Total Cost = Total fixed cost + Total average cost

Total Cost = unit cost x quantity output

Average fixed cost = $\frac{TFC}{Q \text{ output}}$

Average variable cost = $\frac{TVC}{Q \text{ output}}$

Average total cost = $\frac{TC}{Q \text{ output}}$

Average total cost = AFC + AVC

Marginal cost = $\frac{\Delta TC}{\Delta Q \text{ output}}$

Product (aka output):

Average product = $\frac{\text{Total product}}{Q \textit{ input}}$

Marginal product = $\frac{\Delta TP}{\Delta Q \textit{ input}}$

TP @ maximum when MP goes negative

In perfect competition market supply = ∑ individual seller cost curves or S = ∑ mc's

Unit 3 – Production Markets continued

Profit:

Profit maximization rule for all markets:

Marginal Revenue = Marginal Cost or MR = MC

Total cost + total profit = total revenue
also TR = Price x quantity

Total cost = unit cost x quantity

Total profit = unit profit x quantity

Unit 4 – Resource Markets

Marginal revenue product = $\frac{\Delta \text{ TR}}{\Delta \text{ Q of resource}}$

Marginal resource cost = $\frac{\Delta \text{ T resource C}}{\Delta \text{ Q of resource}}$
aka Marginal factor cost

Profit maximization rule when purchasing a single resource:

Marginal Revenue Product = Marginal Resource Cost

or MRP = MRC

In perfect competition market demand for labor = $\sum$ demand of all individual purchasers of labor or D = $\sum$ mrp's

In perfect competition, MRP = product price x marginal product
In imperfect competition, MRP = product price x marginal product MINUS price change on previous units sold
In perfect competition, market wage = individual firms MRC (wage taker)
In imperfect competition (monopsony), wage is MRP = MRC @ labor supply curve (wage maker) /MRC lies above S curve

Least Cost Rule

$$\frac{\text{Marginal product of labor}}{\text{Unit price of labor}} = \frac{\text{Marginal product of capital}}{\text{Unit price of capital}}$$

Profit maximization rule for purchasing multiple resources

$$\frac{\text{Marginal product of labor}}{\text{Unit price of labor}} = \frac{\text{Marginal product of capital}}{\text{Unit price of capital}} = 1$$

Unit 5 - Government

Externalities: MSB = MSC

Market Equilibrium
MPC = MPB
Marginal Private Cost = Marginal Private Benefit

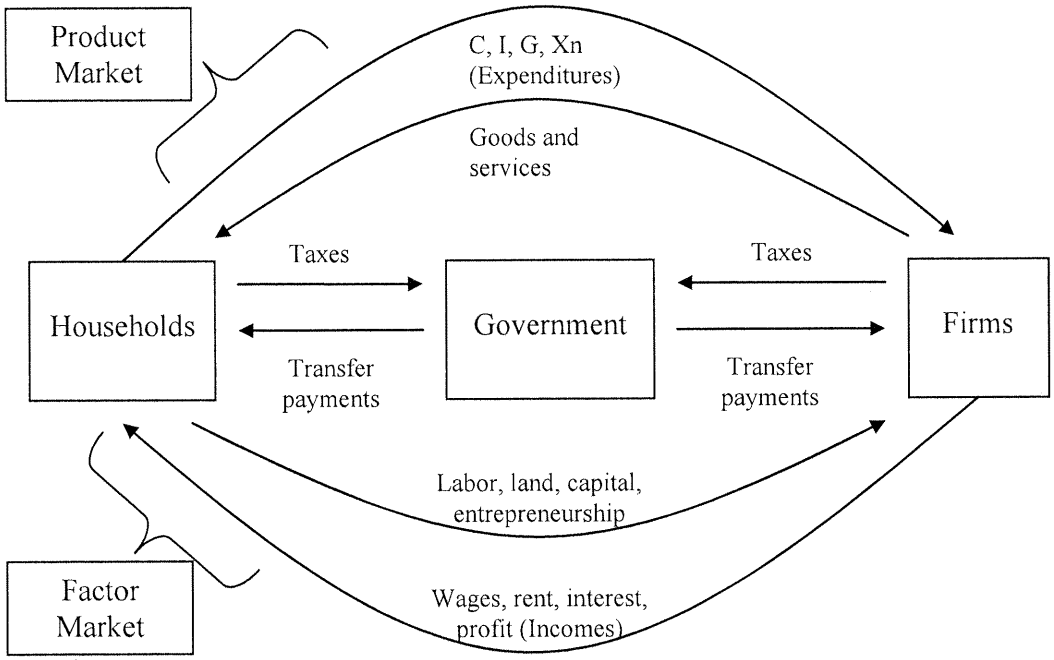
Negative production externality (overallocation):
Social cost > private cost
Example: pollution
Fix: taxes, regulations

Positive production externality (underallocation):
Social cost < private cost
Example: technology
Fix: subsidies, regulations

Negative consumption externality (overallocation):
Social benefit < private benefit
Examples: cigarettes, alcohol, gambling
Fix: taxes, regulations

Positive consumption externality (underallocation):
Social benefit > private benefit
Examples: education, vaccines, smoke alarms
Fix: taxes, subsidies or regulations

Circular Flow Diagram: This is so crucial to understand for both Micro and Macro! Study the flow of income in the resource and product markets, and pay attention to the role of government in the economy.



Implications of Circular Flow diagram: W + R + I + P = C + I + G + Xn

MICRO Concept Review:

Definitions

Supply: A schedule or curve showing the possible combinations of price and quantity supplied.
Law of Supply: There is a direct relationship between price and quantity supplied.

Demand: A schedule or curve showing the possible combinations of price and quantity demanded.
Law of Demand: There is an indirect relationship between price and quantity demanded
Reasons for the law of Demand (why the D curve slopes downward):

- **Income effect:** As price of a good decreases, consumers income *appears to increase*, so consumers demand a greater quantity of a good as the price goes down.
- **Substitution effect:** As the price of one good decreases, other goods *appear to become more expensive,* so consumers demand a greater quantity of the good whose price has decreased.
- **Diminishing marginal Utility:** The more one consumes of a good, the less additional utility that last unit consumed provides, therefore consumers are only willing to buy additional units of a good if the price decreases.

Normal goods: Goods for which Demand increases as consumer income increases (sometimes called *superior goods*).

Inferior goods: Goods for which Demand decreases as consumer income increases. (examples may include fast food, cheap clothes, etc...)

Determinants of Demand: A change in any of the following will result in a *shift of the demand curve,* meaning that at each possible price, a different quantity will be demanded.

T – consumers' tastes and preferences
O – other related goods' prices (compliments and substitutes)
E – expectations of future prices
I – consumers' income
S – size of the market (number of consumers)
S – special circumstances (tsunami, war, etc...)

Determinants of Supply: A change in any of the following will result in a *shift of the supply curve,* meaning that at each possible price a different quantity will be supplied.

S – subsidies (shift supply out) and taxes (shift supply in)
T – technology
O – other related goods prices (substitutes in production, i.e. basketballs and soccer balls)
R – resource costs (land, labor, capital, entrepreneurship)
E – expectations (of future prices)
S – size of the market (number of producers)

Elasticity: measures the responsiveness of one variable to a change in another.

- Price elasticity of Demand: ∑d
- Price elasticity of Supply: ∑s
- Cross elasticity of Demand: ∑xy

$$\sum d = \frac{\%\Delta Qd}{\%\Delta P}$$

$$\sum s = \frac{\%\Delta Qs}{\%\Delta P}$$

$$\sum xy = \frac{\%\ \Delta Qd \text{ of good X}}{\%\ \Delta P \text{ of good Y}}$$

∑>1 - elastic

∑<1 - inelastic

∑=1 – unit elastic

Determinants of price elasticity of demand:

S – substitutes
P – proportion of income
L – luxury or necessity
A – addictive or habit forming
T – time

Determinants of price elasticity of supply: Only TIME. As time goes by, firms are more responsive to changes in price.

- In the **"market period"** firms are unable to respond to price changes.
- In the **"short-run"** firms can intensify production using existing plants, therefore supply is more elastic.
- In the **"long-run"** firms can expand or reduce plant capacity, therefore supply is highly price elastic.

Total Revenue Test:

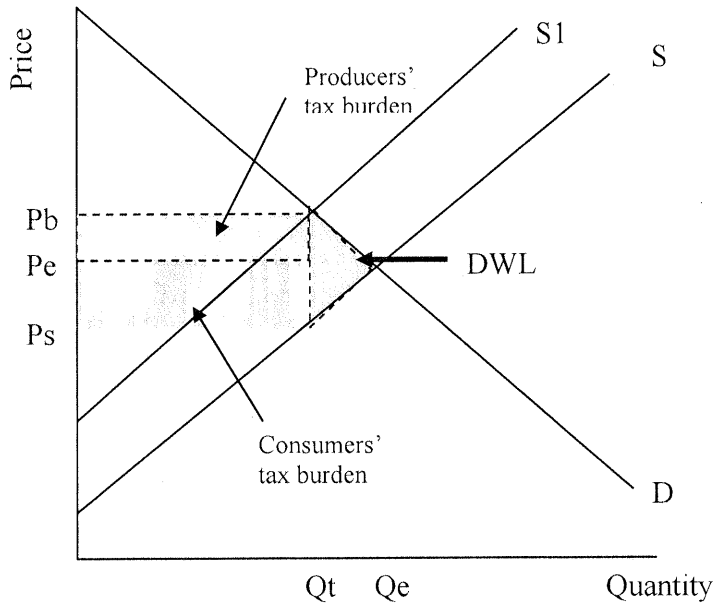
- If P↑ and TR↑ => inelastic D
- If P↓ and TR↓ => inelastic D
- If P↑ and TR↓ => elastic D
- If P↓ and TR↑ => elastic D

Rule of thumb: Price-elasticity of Demand tends to be higher for higher priced (luxury) goods since they make up a larger proportion of income. Price-elasticity of D tends to be lower for lower priced goods since they make up a smaller proportion of income.

The Utility Maximization Rule: The consumer should allocate his/her resources (money income) so that the last dollar spent on each product yields the same amount of extra, marginal utility.

Rule: $\frac{\text{MU of product A}}{\text{P of A}} = \frac{\text{MU of product B}}{\text{P of B}} = \frac{\text{MU of product C, D, E, etc...}}{\text{P of C, D, E, etc...}}$

Tax Incidence and Deadweight Loss



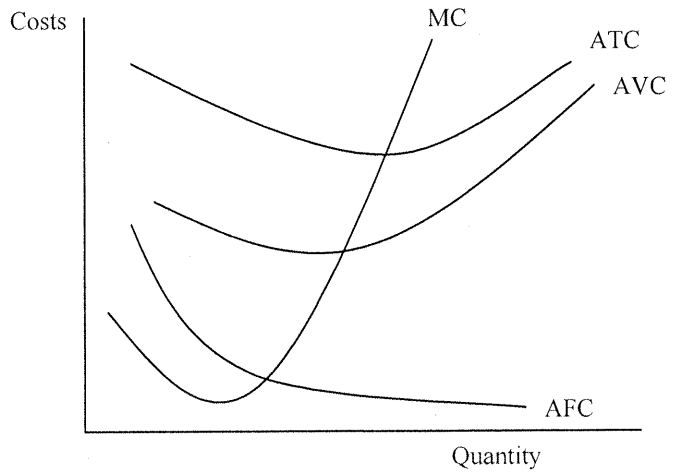
- Pe = Price at equilibrium, pre-tax
- Qe = Quantity demanded and supplied before tax
- Pb = Price buyers had to pay after the tax
- Px = Price sellers received after the tax
- Qt = Quantity demanded and supplied after the tax
- Blue box = Amount of tax born by the consumers in the form of lost consumer surplus
- Yellow box = Amount of tax born by producers in the form of lost producer surplus.
- Combined area of Blue and Yellow boxes = Tax Revenue
- Green box = DWL is the *total efficiency loss* that results from an under or over-allocation of resources towards the production of a good or service

Why would the government impose a tax on a good such as above? Doesn't it only lead to a disequilibrium and thus an under-allocation of resources towards the goods production? Yes, but what if this good creates negative externalities? What if S1 is closer to the MSC (Marginal Social Cost) curve whereas S is the MPC (Marginal Private Cost) curve? In these cases, a tax may be used to correct a market failure (such as second hand smoke or air pollution). Excise taxes like this also may be levied on goods simply to raise revenue to fund government spending (such as a new light rail system or other public or quasi-public goods).

Tax incidence and elasticity: Remember, if Demand is highly *inelastic* then consumers will bear the brunt of the tax burden (i.e. cigarettes and gasoline). If Demand is highly *elastic* then producers will bear the brunt of the tax burden. Be able to graph and explain tax burden with different Demand and Supply price-elasticities.

Costs of Production: You must understand the difference between explicit and implicit costs.

- **Implicit:** the opportunity cost of employing self-owned resources toward one activity rather than another (includes **NORMAL PROFIT**)
- **Explicit:** the money costs of employing resources owned by others, in the form of wages, rent and interest.



Other things to remember about costs:

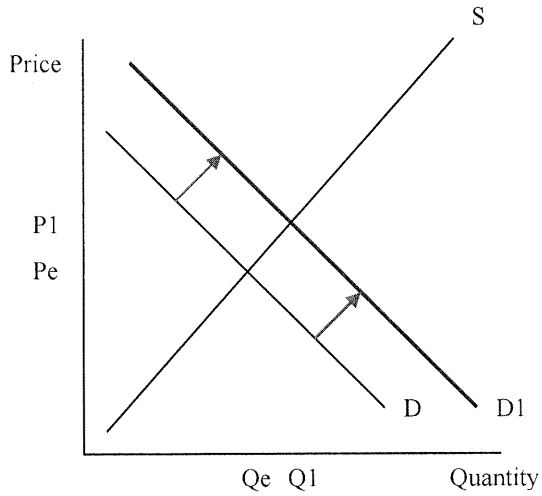
- Total cost (TC) = Fixed costs (FC) + Variable costs (VC)
- ATC = AFC + AVC
- The distance between ATC and AVC represents AFC (which always declines as output increases b/c costs are "spread out").
- AVC is significant for firms to consider, b/c if price ever falls below AVC, the firms best option is to shut down, since it is no longer covering its fixed costs. It would minimize losses by shutting down!
- Again, notice that MC intersects both ATC and AVC at their lowest points; KNOW WHY!
- Understand how the law of diminishing returns influences the shapes of these curves.

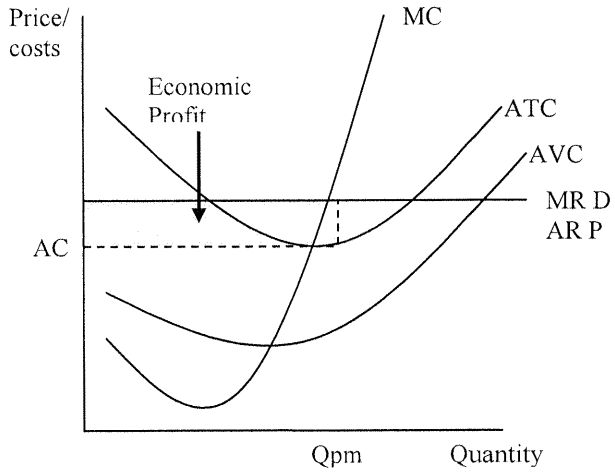
What can cause cost curves to shift? A change in any variable cost (wages to workers, rent on land, interest on loans, etc...) will shift the MC, AVC and ATC curves. Also, an improvement in technology or productivity can cause the curves to shift DOWN.

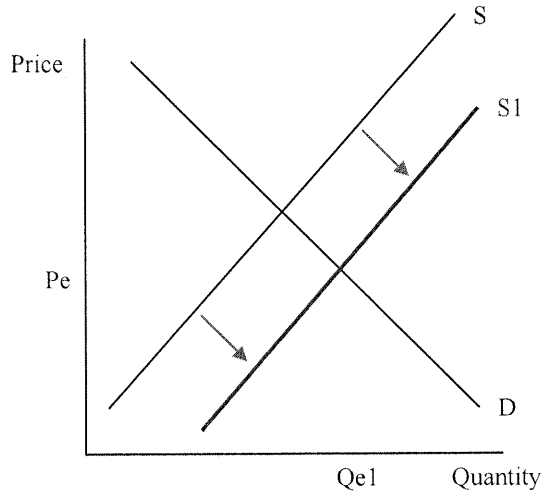
Why is the MC curve an individual firm's supply curve above the AVC? Keep this in mind. A firm will respond to price increases by increasing output as long as price is above AVC (remember the shutdown rule mentioned above). If a firm faces lower costs (wages, rents, interest) then its MC will shift down; this translates to an outward shift of the individual firm's supply curve, meaning that at each price, the firm is willing to supply more output!!

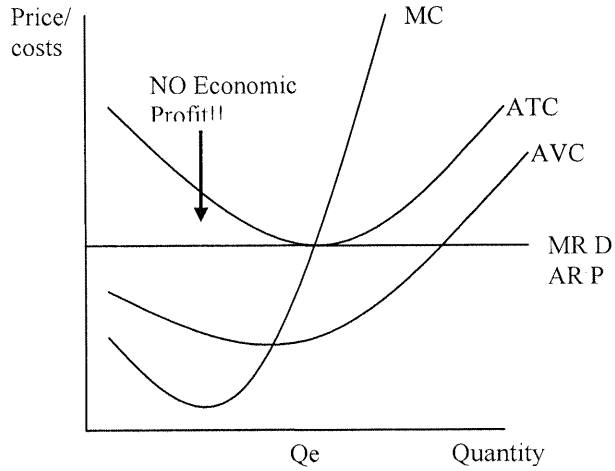
Perfect Competition: YOU MUST KNOW EVERYTHING ABOUT "PC".

- Be able to draw a PC market with a representative firm. This skill helps you to understand all other market structures.
- Must ALWAYS include the AVC curve in PC graphs!
- Be able to illustrate the scenario where a firm is earning economic profits (or losses) and describe the long-run adjustments that lead to the elimination of those profits (or losses).
- Understand the "shut-down" scenario (when P falls below AVC)
- Know the characteristics of a PC industry: no barriers to entry, homogeneous product, low start-up costs, etc...
- Understand why the PC firm's Demand curve is perfectly elastic (firms are price takers) and why D = MR = AR = P.
- Again, understand that a firm's MC curve above its AVC IS ITS SUPPLY CURVE. The horizontal sum of all individual firms' MC curves in a given market is the industry Supply curve.









PC Graphs: You must understand and be able to illustrate a scenario such as above where...

- An initial increase in D for a product drives up price above min ATC. Firms earn economic profits in the short-run.
- Remember, profits are "FIRM MAGNETS", so new firms enter this PC market since there are no barriers to entry and there are profits to be had!
- The new firms output pushes the market Supply curve outward, which lowers the market price.
- Price will fall back to the minimum ATC, at which point firms earn ZERO economic profits, only normal profits.

What if price falls below minimum ATC? This may happen if the initial shift of the Demand curve had been to the left, due to a decrease in Demand for the product in question.

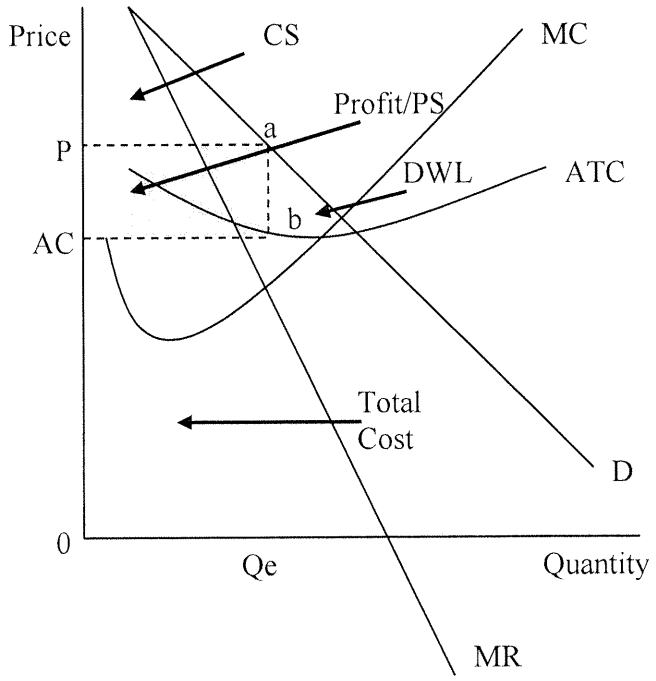
- This will mean in the short-run firms will earn economic losses.
- Remember, LOSSES ARE "FIRM REPELLANTS". Firms are scared off by losses! Since there are no barriers to exit, firms will leave the industry to seek profits elsewhere.
- The exit of firms will shift the market supply curve to the left, increasing the price until losses are eliminated, restoring equilibrium.

REMEMBER: In the long-run equilibrium in perfect competition...

- Firms will only *break even* (earn zero economic profits).
- Price will be equal to Marginal Cost (this assures **ALLOCATIVE EFFICIENCY)**
- Price will be equal to minimum Average Total Cost (this assures **PRODUCTIVE EFFICIENCY)**
  Thus: PC industries are the most efficient type of market structure.

Consumer and Producer Surplus: CS is the area above the price line and below the Demand curve. Producer Surplus is the area below the price line and above the Supply (or Marginal Cost) curve. This is true for any market structure.

In Monopoly



Things to notice about the Monopoly graph above:

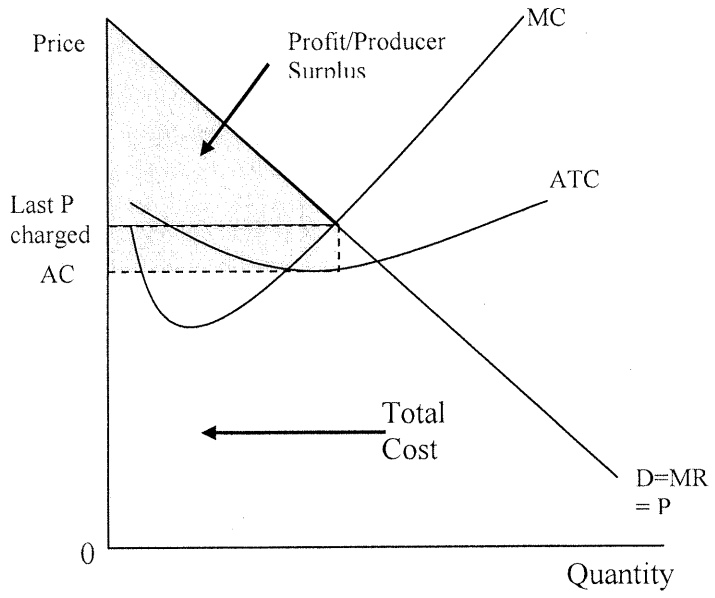
- Marginal Revenue lies below Demand: Since a monopolist is the only seller of its product, in order to sell additional units, it must lower the price of all previous units, so its MR falls at a faster rate than the price it charges.
- There is Consumer Surplus in a single-price monopoly. Again, the area above the single price line and below the Demand curve represents CS.
- The Producer Surplus exists in the area below the price line and above the firm's MC curve. This represents the additional wellbeing attained by selling for a price above the MC of production.
- The firm is achieving economic profit (TR – TC > 0). This is because it is able to restrict output to the MC = MR level in order to maximize profit (represented by the rectangle P, a, b, AC).
- TC is found by taking the firms ATC at the profit maximizing level of output and multiplying it by output. This is represented by the rectangle AC, b, Qe, 0.

- Just as in all markets, the firm's MC curve sloped downward in the early level of output (due to increasing marginal returns) then upwards as output increases (due to the law of diminishing marginal returns).
- Notice that the MC intersects the ATC curve at its lowest point. You MUST know why this happens: **because if the cost of the last unit produced was lower than the average unit, then average cost will decrease, and vis versa (remember your grade in class; if you do better on this test than you've averaged in the class, your average will go up!)**
- Notice that there is Deadweight Loss in a monopoly! This means monopolies are an example of a **MARKET FAILURE!** Resources are under-allocated towards the production of the good!

Other points of review on Monopoly:

- Understand how an unregulated monopoly will restrict output to maximize profits (thus it's a market failure)
- Understand the characteristics and implications of a *natural monopoly* (see below).
- Review and understand the implications of a perfectly price discriminating monopolist: *Consumer surplus is turned into profit for the firm, allocative efficiency is achieved since the last price charged is equal to MC, and deadweight loss is eliminated!* **Notice: price discrimination could be thought of as beneficial to society for these reasons!**

Price Discriminating Monopoly



Graph for price discrimination:

- All Consumer Surplus from the single – price firm is turned into monopolist profit and producer surplus (the green trapezoid)
- MR shifts up to align with D (P) price charged for the last unit sold is different for each unit, allowing the firm to extract the from each buyer exactly what he or she is willing to pay.
- Monopolist now produces at the profit maximizing level of output (MR = MC).
- P = MC, so allocative efficiency is achieved.
- Notice, productive efficiency is not achieved, as the monopolist is not producing at min. ATC.

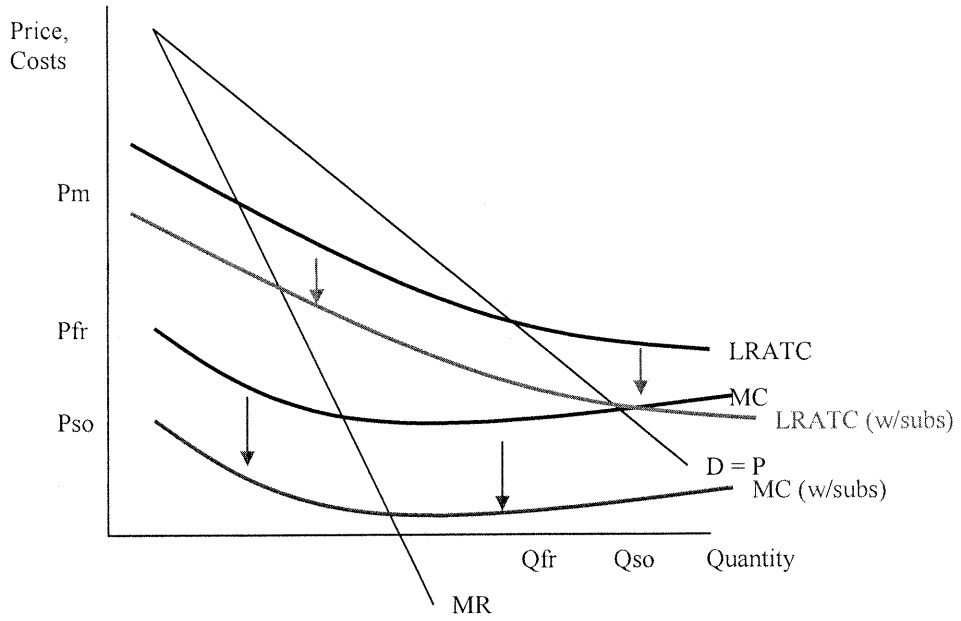
Formula for Market Power: This useful formula can be used to measure the amount of market power held by an individual firm.

Market Power (Lerner index) $L = \frac{(P - MC)}{P}$

- In perfect competition, P = MC, so L will be Zero!!
- In monopoly, P will always be greater than MC, so this will be a positive number.
- The higher price is than marginal cost, the more market power the firm has.

Natural Monopoly (This could VERY LIKELY be on the FRQ section this year): A natural monopoly exists when the market Demand for a good intersects the long-run ATC curve while it is still in the downward sloping (economies of scale) section. In other words, it is more efficient for one firm to provide the product than for several firms to, since there is insufficient demand for even one firm to achieve minimum efficient scale.

Natural monopolies sometimes exist in industries in which economies of scale are significant and the market demand is insufficient for a firm to achieve minimum efficient scale. In other words, one monopolistic provider can meet market demand at a lower ATC than if multiple firms were to split the market among themselves. Study the graph below and understand how the following are determined



Natural Monopoly graph:

- **Pm and Qm:** These are the price and output of an unregulated monopoly; occur at the profit maximizing output level where MR = MC
- **Pso and Qso:** These are the *socially optimal* price and output levels. They are determined by producing where D (P) = MC, since this point represents allocative efficiency. This combination of P and Q will lead to the monopolist shutting down, since P is less than ATC.

- **Pfr and Qfr:** This is the fair-return price and output level. Regulators may choose to set a price ceiling at Pfr so that the monopolist can still maintain normal profits (P = ATC), but still increase output so it's closer to the socially optimal level. If the monopolist were forced to sell at a price lower than this, it would earn losses and eventually shut down.

Alternatives to a price ceiling at Pfr: Notice that a regulatory commission's price ceiling at Pfr, while it does increase output and lower price, is still below the socially optimal level of output (and price is still above socially optimal price).

- An alternative to a price ceiling is **a direct subsidy to the monopolistic firm**.
- Remember, Subsidies are a determinant of supply. In other words, a subsidy would shift the MC and LRATC curves downward, allowing the firm to produce a greater quantity at a lower cost (thus price to the consumer) further helping achieve a more socially optimal price and output.
- Notice LRATC (w/sub): The subsidy shifts the firm's costs down, allowing it to achieve normal profits at the socially optimal level of output and price.

Definitions:

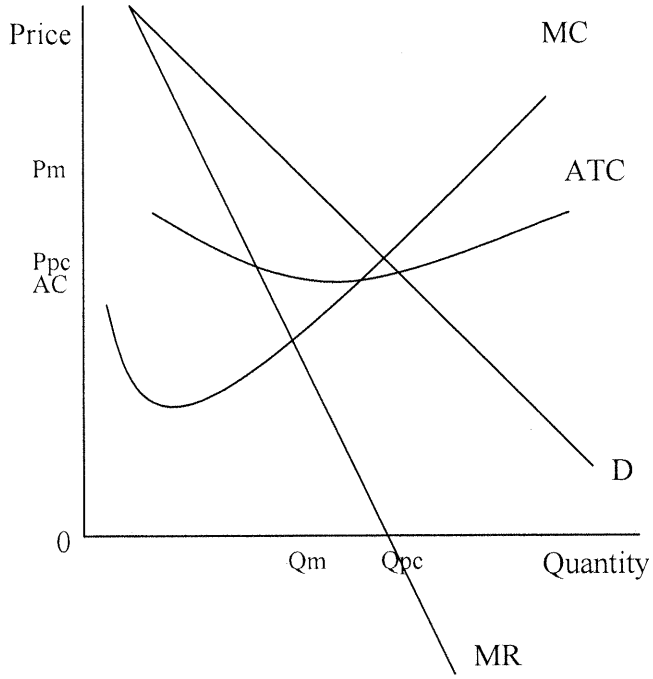
Economic Rent: Additional income received for going to an alternative job.
Example:

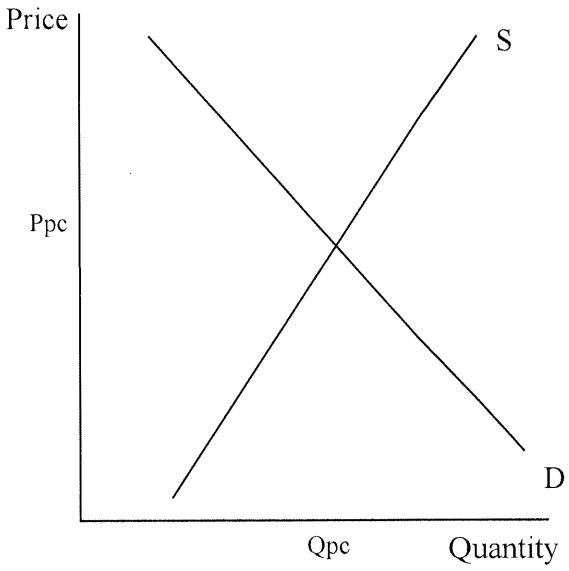
- Shaquille O'neal earned $22,000 as a DJ his last year before joining the NBA
- During his first year, Shaq earned $22,000,000.
- His economic rent had he chosen to remain a DJ would have been $22m - $22k = $21,978,000. *Shaq would have paid very high economic rent had he remained a DJ*

Rent-seeking behavior: This is any expenditure made by a firm to achieve or try to preserve monopoly power. *Lobbying!!* This may be Microsoft trying to defend its right to bundle Internet Explorer with its Windows operating system, or a steel company paying lobbyists to influence legislatures to place high tariffs on imported steel.

Excess capacity: When firms produce less than the socially optimal quantity in order to maximize profits. Excess capacity exists in any imperfectly competitive market. If firms are not producing at their minimum ATC, they probably have excess capacity.

From Monopoly to Pure Competition: It is very common for an FRQ to pose a scenario where you *"suppose an industry that was monopolistic becomes perfectly competitive"* or something like that. You must be able to graph and explain the transition from monopoly to pure competition and the implications on price, output, CS, and efficiency.



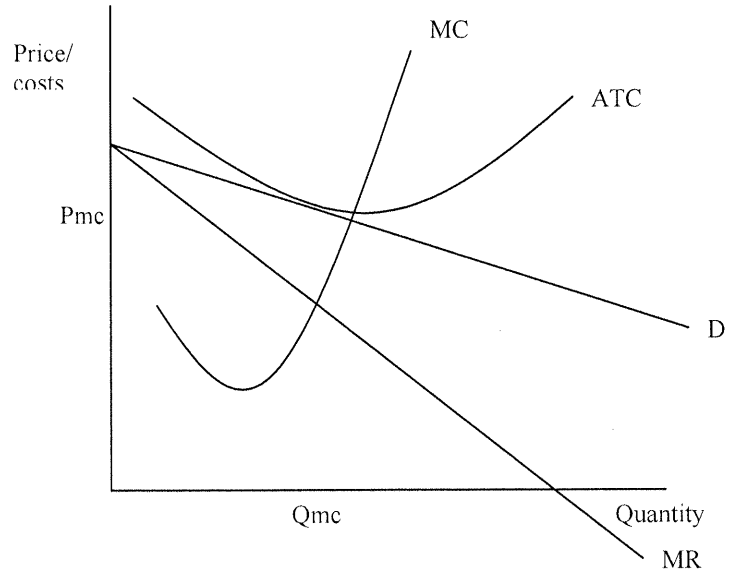


From monopoly to perfect competition graphs:

- Be sure to emphasize that in PC, price is lower and output higher. This is because perfect competition assures that an efficient, market clearing price and output are achieved.
- Notice that in monopoly, output is lower and price is higher than in pure competition.
- Notice that the price in pure competition can be found in the monopoly diagram by finding the intersection of P and MC, since we know that this is the outcome of purely competitive markets.
- You may also need to draw a perfectly competitive firm alongside these to graphs. Look in the early section on PC for a firm diagram.

Monopolistic Competition: The major difference b/w monopolistic competition and perfect competition is **PRODUCT DIFFERENTIATION!!**

- Firms advertise to differentiate themselves from their competition. This allows them to have slight control over price (think of Colgate and Crest sitting on the shelf at Carrefour; they probably cost more than the 50 other Chinese brands of toothpaste).
- Barriers to entry and exit are LOW, so if economic profits are being earned, then firms will enter (if losses are earned, firms will exit). **Knowing this, we can conclude that in the long-run, monopolistic competitors should only earn normal profits!**
- However, due to successful advertising and **BRAND LOYALTY**, some firms in monopolistically competitive markets are able to maintain economic profits in the long-run.



Monopolistic Competition graph:

- D is more elastic than in monopoly, b/c there are more substitutes for the product.
- MR lies below D (and P) b/c in order to sell additional output, firms must lower the price of all previous units of output.
- This firm is in equilibrium, b/c ATC is tangent to the D curve. Due to low barriers to entry, if D were to shift out and P go up, more firms would enter, shift the D curve faced by the individual firm back in, lowering price back to the level of ATC.
- **Notice:** Although it appears to be close to min. ATC, this firm is not achieving min. ATC, so **it is not productively efficient.**
- At the profit maximizing level of output (where MR = MC) P does not equal MC (since P is greater than MR). Therefore, **this firm is not achieving allocative efficiency**.
- Monopolistically competitive firms are destined to earn only **NORMAL PROFITS** and the industry is **INEFFICIENT** since there is an under-allocation of resources towards the production of this good.

Oligopoly and Game Theory: The AP does not test on kinked Demand curve theory, therefore you must review Game Theory as a tool for understanding the behavior of oligopolistic firms. First review the characteristics of Oligopolies:

1. Only a few firms (2-20)
2. High barriers to entry
3. Homogenous (diamonds and metals) or differentiated (Boeing vs. Airbus, operating systems) products
4. **INTERDEPENDENCE:** In other words, one firms pricing and output decisions are based entirely on what its competitors will do!

Game Theory: It has been hinted that this could VERY LIKELY appear in the FRQ section of this year's exam!

- Oligopolies' behavior is like a game, because competitors play for payoffs:
    1. win – win

2. win – lose
3. lose – lose

- Games are usually played by choosing a pricing or advertising strategy based on a competitor's decision.
- The strategy for a player is one that maximizes expected payoff.
- Games can be cooperative or non-cooperative
  1. Cooperative: players negotiate binding contracts, which leads to joint strategies. Usually only possible if there are a small number of players (an economic example of this is cartels)
  2. Non-cooperative: enforcement of contracts is difficult or impossible, usually because there are a large number of players (firms) involved; there is too much of an incentive to "cheat" (by either lowering prices to steal customers or by advertising to attract customers from competitors).
- Players MUST take into account the *likely* behavior of other players (firms).

TWO possible outcomes you must know for the AP exam:

1. **Dominant Strategy:** this is the strategy that's optimal regardless of what an opponent does. Firms do NOT always have a dominant strategy!!
2. **Nash Equilibrium:** the set of strategies in which each firm does the best it can given its competitors' actions; because each player has no incentive to deviate from its Nash strategy.

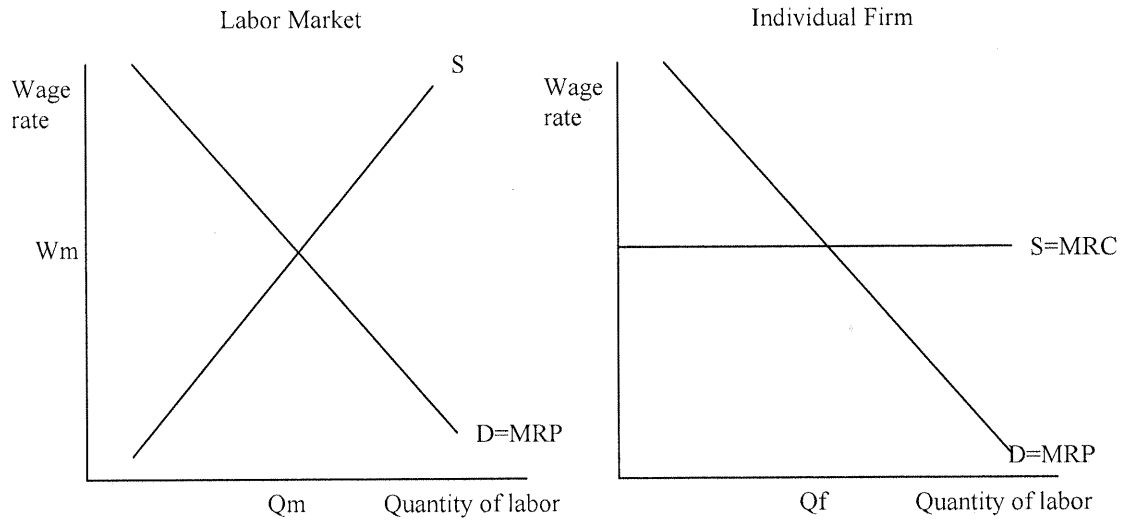
SEE GAME THEORY APPENDIX FOR FURTHER REVIEW AND EXAMPLES OF PAYOFF MATRIXES.

Resource Markets: This is where firms go to hire works, rent land, borrow money, and so on. Refer to the circular flow diagram to see what transactions take place in the resource (factor) market. Resource demand is **DERIVED DEMAND**. Demand for any input is derived from the demand for the output that those inputs produce

Main points about resource demand:

- Firms will hire workers (or other inputs) until the Marginal Resource Cost (MRC) = Marginal Revenue Product (MRP)
  - MRC: The additional cost to a firm of hiring one more worker.
  - MPP: Marginal physical product. This is the number of additional units contributed by the last worker hired.
  - MRP: The amount of additional revenue contributed by the last worker hired. MRP = MPP x P
- In a resource market, the Supply curve represents households (who provide the productive resources) and the Demand curve represents firms (which require resources to produce anything).
- A firm's Demand for labor curve is the same as the MRP curve.
- In a purely competitive labor market, firms are wage takers; in other words no matter how many workers a firm hires, it cannot affect the market wage rate.

Perfectly competitive labor market and firm



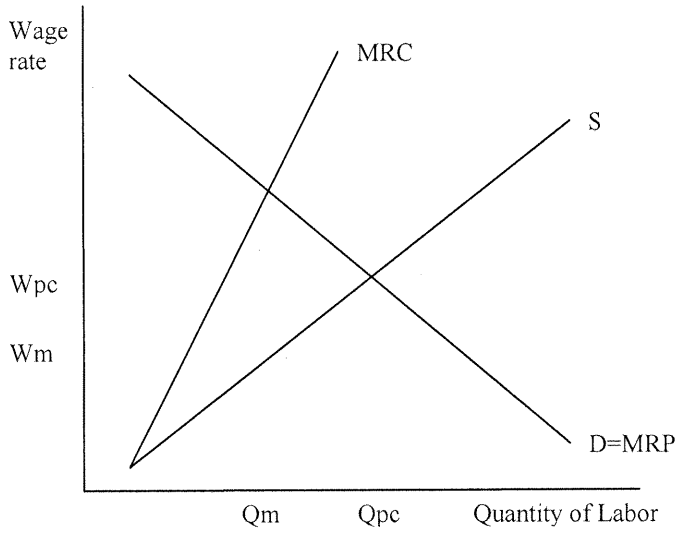
Least-cost Rule of employing resources: In order to produce a specific output with the *least-cost combination of resources* a firm should employ labor and capital up to the point where the last dollar spent on each resource yields the same marginal product.

- **Least cost combination of Labor and Capital:** $\frac{MPP_L}{P_L} = \frac{MPP_C}{P_C}$

Profit-maximizing Rule of employing resources: In competitive markets, a firm will achieve its profit-maximizing combination of resources when each resource is employed to the point at which its marginal revenue product equals its price.

- **Profit-maximizing combination of Labor and Capital**: $P_L = MRP_L$ and $P_C = MRP_C$
- **Or stated otherwise**: $\frac{MRP_L}{P_L} = \frac{MRP_C}{P_C} = 1$

Monopsony: A monopsonistic firm is one that is the sole employer in a particular labor market. Similar to a Monopoly in a product market, except in the firm is now a *wage maker*, not a wage taker as in a purely competitive labor market. In other words, in order to attract an additional worker, the firm must raise wages for all workers hired previously. For that reason, a monopsonist's MRC curve lies above its Supply of labor curve.



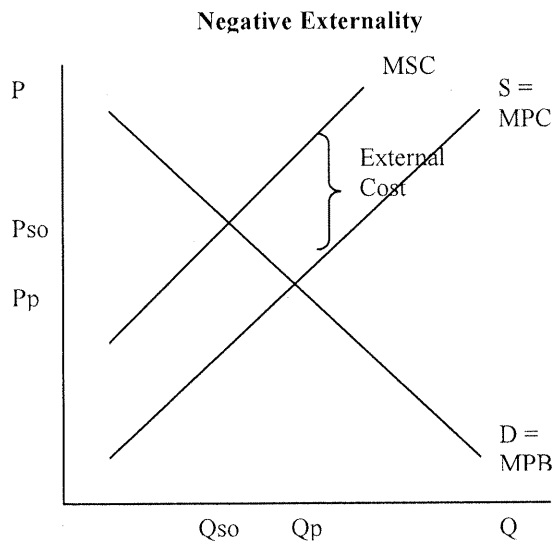
Monopsony Graph: Observations...

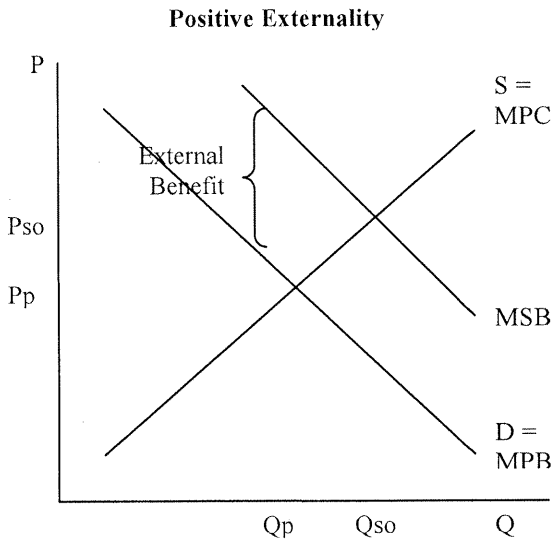
- The monopsonist will employ workers up to the point where the MRP = the MRC.
- The monopsonist will only pay the wage necessary to attract Qm workers
- At Qm (quantity of labor demanded by the firm), the firm has to pay a wage rate of Wm.
- Notice that if this were a purely competitive labor market, the Supply curve and the MRC curve would be the same, and firms would employ Qpc and pay a wage rate of Wpc.
- **Conclusion:** Monopsony employers hire fewer workers and pay lower wages than firms in a purely competitive labor market.

Market Failure: Markets sometimes fail to achieve an efficient or socially optimal price and output level. This may be for four reasons:

1. Public Goods *(this is the most commonly tested market failure in the AP and should appear as a definitional MC problem)*
    a. *Non-rival in consumption*
    b. *Non-excludable*
    c. *Free-rider problem*
    *Public goods are not provided by the market because of the above characteristics they possess. They simply cannot be broken down into sellable units.
2. Positive and Negative externalities
    a. Spillover benefits
    b. Spillover costs
3. Imperfectly competitive markets
    a. Monopoly
    b. Oligopoly
    c. Monopolistic competition
4. Asymmetrical information: someone has access to information that someone else doesn't, so market price does not account for the true cost.
5. Moral Hazard: a type of information failure usually associated with insurance where a buyer of insurance keeps information from the insurance company that it should know.

Graphing Market Failure: For the exam, you must be able to graph positive and negative externalities and imperfect competition (covered above).





Understanding the externality graphs:

- Negative externality: This may represent a market for electricity generated by burning coal.
  - Pp and Qp represent a price and output when external costs are ignored
  - Pso and Qso are the socially optimal price and output, which take into account the amount of costs spilled over onto society.
- Positive externality: This may represent a market for vaccinations.
  - Pp and Qp represent the price and output when the positive benefits of vaccinations are ignored.
  - Pso and Qso represent the price and output when the positive benefits of vaccinations are taken into account.

Tools for correcting market failure:

1. Direct government regulation: government can require firms to provide a good that produces spillover benefits (such as public goods) or require firms NOT to produce goods that have spillover costs.
2. Taxes and subsidies: Government can tax firms producing goods that create negative externalities (shifting the MPC curve up towards the level of MSC) or subsidize producers or consumers of goods that create positive externalities (shifting the MPB curve in the direction of MSB or the MPC curve in the direction of MSC).
3. Government provision: The government can provide (or contract out the provision of) public goods such as roads, the postal system, national defense, education, etc...

4. Market for externality rights: The government and scientists can decide on an acceptable level of a particular harmful spillover of production such as pollution. It can issue each polluting firm a certain number of permits, the total of which equals the acceptable amount of pollution. Firms that are already polluting less than their permits allow them to can sell those permits to firms that are polluting more than they're permitted to. This gives ALL FIRMS AN INCENTIVE TO REDUCE THEIR POLLUTION, SINCE PROFITS CAN BE EARNED BY NOT CLEANING UP!
5. The Coase Theorem: Would only work when a few parties are involved; involves direct negotiation between the party creating a spillover cost and the party suffering from it.

SAMPLE MICRO Qs

Practice AP-style test for Sections 9-11

1. A good with a price elasticity of demand of .2 is called:
A. price elastic, because there is a small response of quantity demanded to a change in price.
B. price elastic, because there is a large response of quantity demanded to a change in price.
C. price inelastic, because there is a small response of quantity demanded to a change in price.
D. price inelastic, because there is a large response of quantity demanded to a change in price.
E. unit elastic, because the response of quantity demanded is equal to the change in price.

Correct answer: C
Explanation: A price elasticity of demand less than one is the result when the percentage change in quantity demanded is small relative to the percentage change in price. We calculate price elasticity of demand with this formula: percentage change in quantity demanded/percentage change in price.
Section 9: Module 47

2. Moving from left to right along a downward sloping demand curve, beginning at the quantity where total revenue starts to decrease, demand is:
A. elastic, because a higher price reduces total revenue.
B. elastic, because a lower price reduces total revenue.
C. unit elastic, because a change in price does not affect total revenue.
D. inelastic, because a higher price increases total revenue.
E. inelastic, because a lower price increases total revenue.

Correct answer: D
Explanation: Downward sloping demand curves have elastic and inelastic portions. The inelastic portion begins at the point where total revenue ((price)(quantity)) starts to decrease as price decreases.
Section 9: Module 47

3. Select from the following to complete the sentence below.
Cross-price elasticity of demand between two goods gives information about:

I. whether the goods are complements of each other
II. whether the goods are substitutes for each other
III. what happens to quantity demanded for a good when its price changes
IV. what happens to the demand for a good when its price changes
V. what happens to the demand for one when the price of the other changes

A. I and III
B. II and III
C. I, II, III, and V
D. I, II, and V
E. I, II, and IV

Correct answer: D
Explanation: Cross-price elasticity of demand gives insight as to how two goods are related to each other. Knowing the coefficient of price-elasticity of demand tells us whether goods are substitutes, complements, or not related at all. If the goods are related, the coefficient is an indicator of how strong the relationship is.
Section 9: Module 48

4. The difference between a buyer's willingness to pay and the price paid is known as:
A. excess surplus.
B. demand.
C. profit.
D. producer surplus.
E. consumer surplus.

Correct answer: E
Explanation: Some buyers are willing to pay more than the price charged. They enjoy a surplus in that the value they place on the good exceeds the amount they must pay to get the good.
Section 9: Module 49

5. Total surplus is maximized when:
A. a good is reallocated from those more willing to pay to those less willing to pay.
B. a good is sold at the equilibrium price.
C. sales are reallocated from those more willing to sell to those less willing to sell.
D. a maximum price rule is imposed to increase surplus for consumers.
E. a minimum price rule is imposed to increase surplus for producers.

Correct answer: B
Explanation: Surplus is measured as the area bounded by the demand curve, supply curve, and y-axis. Any effort to increase surplus by reallocating surplus from consumer to producer or from producer to consumer results in total surplus decreasing. Similarly, changing equilibrium quantity decreases total surplus.
Section 9: Module 50

6. When a consumer maximizes utility in the face of a budget constraint, the _____ in the consumption bundle is the same.
A. marginal utility of each good
B. demand for each good
C. price paid for each good
D. marginal utility per dollar spent on each good
E. quantity demanded for each good

Correct answer: D
Explanation: We wouldn't expect to get the same utility from each of the different goods we consume, so it wouldn't make sense to try to consume them in quantities that make the marginal utilities equal. Instead, we know that we are maximizing utility if on a per dollar spent basis, the marginal utilities for each good and service in our consumption bundle are equal.
Section 9: Module 51

7. When is economic profit equal to normal profit?
A. when economic profit is zero
B. when economic profit is negative
C. when accounting profit is negative
D. when normal profit is negative
E. when normal profit is zero

Correct answer: A
Explanation: Normal profit is what the firm must earn in order to keep doing what it is doing. It is making enough to cover all of its costs. An economic profit of zero means that the firm has covered all of its costs, explicit and implicit, and that there is nothing left over. By definition, an economic profit of zero is the same as normal profit: exactly enough revenue to cover all costs, with nothing left over.
Section 10: Module 52

8. If marginal revenue is $8, and marginal cost is $5 and rising with the production of each additional unit of output, which statement is true?
A. Producer can do nothing to increase profit.
B. Producer should decrease output to maximize profit.
C. Producer is incurring minimum loss.
D. Producer is earning normal profit.
E. Producer should increase output to maximize profit.

Correct answer: E
Explanation: The optimal output rule states that profit is maximized by producing the quantity of output at which the marginal revenue of the last unit produced is equal to its marginal cost. In order to make MR and MC equal in this question, more output must be produced. MC is rising with the production of each additional unit of output. By producing more, MC will continue to rise.
Section 10: Module 53

9. A firm in any market structure will maximize profit by:
A. producing where marginal revenue exceeds marginal cost.
B. producing where marginal revenue and marginal cost are equal.
C. producing where total revenue and total cost are equal.
D. producing where total revenue and marginal revenue are equal.
E. producing where average revenue and average total cost are equal.

Correct answer: B
Explanation: The optimal output rule applies all market structures.
Section 10: Module 53

10. Use the following information to answer the question below.

Quantity of Labor	**Total Output**	**Total Revenue**
0	0	0
1	3	15
2	6	36
3	10	50
4	15	75
5	19	95
6	22	110
7	20	100

Diminishing marginal returns set in at which level of input?
A. 3
B. 4
C. 5
D. 6
E. 7

Correct answer: C
Explanation: Marginal returns are calculated by dividing the change in total quantity by the change in quantity of input (here, labor). Marginal returns start to get smaller when the fifth worker is added. 10 – 6 = 4; 15 – 10 = 5; 19 – 15 = 4; 22 – 19 = 3.
Section 10: Module 54

11. Identify the INCORRECT statement.
A. Marginal Cost = Change in Total Cost/Change in Quantity of Output
B. Average Total Cost = Change in Total Cost/Change in Quantity of Output
C. Fixed Cost = Total Cost – Variable Cost
D. Average Variable Cost = Variable Cost/Quantity of Output
E. Average Fixed Cost = Fixed Cost/Quantity of Output

Correct answer: B
Explanation: Average Total Cost = Average Fixed Cost + Average Variable Cost; OR, Average Total Cost = Total Cost/Quantity of Output
Correct answer: B
Section 10: Module 55

12. The marginal cost curve intersects the average total cost curve:
A. when average total cost is rising.
B. when average total cost is falling.
C. where average fixed cost is rising.
D. at the maximum average total cost.
E. at the minimum average total cost.

Correct answer: E
Explanation: When marginal cost is below average cost, average cost is falls. When marginal cost is above average cost, average cost rises. Since marginal cost follows a rather predictable pattern of declining before inclining, we know that once marginal cost intersects average cost, marginal cost will continue to increase and thus average cost will, from that point, fall no more but rise instead.
Section 10: Module 55

13. Which is true regarding diminishing marginal returns?
I. it occurs in the long run
II. it occurs in the short run
III. it explains the upward portion of the marginal cost curve
IV. it explains the shape of the long-run average total cost curve
A. I, II, III, and IV
B. I, III, and IV
C. I and III
D. II and III
E. II, III, and IV

Correct answer: D
Explanation: Diminishing marginal returns is a short run issue by definition. It explains what happens when at least one input is fixed. As marginal product decreases, i.e., as marginal returns diminish, marginal cost increases. In the long run, all inputs are variable, i.e., no inputs are fixed in the long run.

Section 10: Module 56

14. Consider price-setting power for firms in different market structures. Which of the following choices lists a progression from least price-setting power to most price-setting power?
A. perfect competition, monopolistic competition, oligopoly, monopoly
B. perfect competition, oligopoly, monopolistic competition, monopoly
C. monopoly, monopolistic competition, oligopoly, perfect competition
D. monopoly, oligopoly, monopolistic competition, perfect competition
E. monopolistic competition, perfect competition, oligopoly, monopoly

Correct answer: A
Explanation: Increasing barriers to entry limits the number of firms in market structure. Perfect competition has no barriers to entry, monopolistic competition has few, oligopoly has relatively more, and monopoly has complete barriers to entry (which is why a monopoly has no company in the market structure!).
Section 10: Module 57

15. A price-taking firm's optimal quantity of output occurs where price equals marginal cost because:
A. a price-taking firm always breaks even.
B. price is equal to marginal revenue for a price-taking firm.
C. price is necessarily greater than marginal cost for price-taking firm.
D. marginal cost is the same as marginal revenue for a price-taking firm.
E. marginal revenue exceeds marginal cost at this point.

Correct answer: B
Explanation: Because price is equal to marginal revenue for a price-taking firm, p = mc fits the optimal output rule for a price-taker.
Section 11: Module 58

16. The equation "(average revenue)(quantity) minus (average cost)(quantity)" equals:
A. (marginal revenue)(quantity) minus (marginal cost)(quantity).
B. total earnings.
C. profit.
D. average profit.
E. marginal profit.

Correct answer: C
Explanation: (AR)(Q) – (AC)(Q) = total revenue – total cost = profit
Section 11: Module 59

17. In perfect competition, firms break even in the long run because:
A. they produce where marginal revenue equals marginal cost.
B. production costs are high in perfectly competitive industries.
C. free entry and exit eliminates profits and losses.
D. marginal revenue and price are equal.
E. variable costs are eliminated in the long run.

Correct answer: C
Explanation: Because firms can enter and exit the market easily in perfect competition, firms are readily able to react to profits and losses. Profits entice new firms to enter the market. As industry supply increases, market price drops, eliminating profit. Losses drive existing firms out. As industry supply decreases, market price rises, eliminating loss.
Section 11: Module 60

18. Identify statements that apply to monopoly.
I. It is more efficient than a firm in perfect competition.
II. Profit is maximized at a quantity of output where MR = MC.
III. It charges a higher price than would a firm in perfect competition facing the same costs.
A. I and III
B. II and III
C. I, II, and III
D. I and II
E. II only

Correct answer: B
Explanation: A monopolist is less efficient than is a perfectly competitive firm because it produces neither where price equals marginal cost nor where price equals average total cost. Producing where price equals marginal cost is allocative efficiency. Producing at lowest ATC is productive efficiency. This is the zero profit condition. Producing at lowest ATC is productive efficiency, and producing up until when P = MC is allocative efficiency . A monopolist's demand curve is downward sloping unlike the perfectly elastic (horizontal) demand curve of a perfect competitor, so when it finds profit-maximizing output at MR = MC, the corresponding price on the demand curve will be higher than the price found in perfect competition.
Section 11: Module 61

19. Considering efficiency in the case of a firm in perfect competition and of monopoly where costs and demand are the same for each, which of the following is true?

I. Consumer surplus is larger in perfect competition.
II. Profit is larger in perfect competition.
III. Deadweight loss is larger in perfect competition.

A. I and II
B. I and III
C. II and III
D. I, II, and III
E. I only

Correct answer: E
Explanation: See page 618 for a comparison of graphs showing perfect competition and monopoly.
Section 11: Module 62

20. Price discrimination:

I. increases efficiency in the market.
II. creates inefficiency in the market.
III. is a way to sell the same good or service at different prices.
IV. is a way to keep customers with more elastic demand out of the market.
V. allows producers to capture consumer surplus.

A. I, III, IV, and V
B. II and V
C. II, III, and V
D. I, III, and V
E. II and IV

Correct answer: D
Explanation: Price discrimination expands the market to include some customers who would have been priced out of the market at the higher price. In this way, it increases efficiency: more who are willing to pay get to have the product. The producer captures consumer surplus because it is able to take revenue from some buyers at a higher price. In other words, the firm makes sales at a higher price to consumers with a high willingness to pay; those buyers lose surplus because they are charged close to the highest price they are willing to pay.
Section 11: Module 63

Free-Response Questions for Sections 9-11

1. Refer to the table provided.

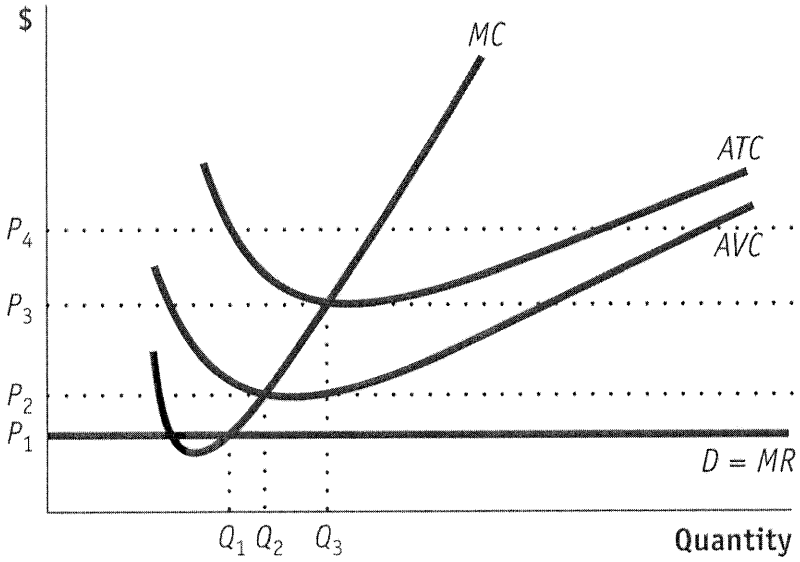
	Model Trains	Model Snowmobiles
Price	$20	$35
Marginal utility of last unit	40	70
Quantity purchased	3	2

a. Hank enjoys playing with model trains and model snowmobiles and spends all of his money on these two items. Is Hank maximizing his utility at his current level of consumption? Explain.
b. Define marginal utility.
c. The price of model snowmobiles increases to $40. To maximize his utility, should Hank buy more trains and fewer snowmobiles, fewer trains and more snowmobiles, or maintain his current level of consumption? Explain.

Rubric:

a. 1 point: Hank is maximizing his utility at his current level of consumption because the marginal utility per dollar spent on each item is the same. In other words, $MU_{model\ train}/P_{model\ train} = MU_{model\ snowmobile}/P_{model\ snowmobile}$.
b. 1 point: Marginal utility is the change in total utility resulting from consuming one additional unit of a good or service. It is the additional utility one gains from consuming one more unit.
c. 1 point: More model trains, fewer model snowmobiles. Plugging in the numbers to the formula $MU_{model\ train}/P_{model\ train} = MU_{model\ snowmobile}/P_{model\ snowmobile}$, we get 2 = 1+, which is not true. To make the two equal, we want $MU_{model\ train}$ to decrease and $MU_{model\ snowmobile}$ to increase. Buying more model trains and fewer model snowmobiles would achieve this.

Use the following Figure 1-1 to answer Free Response Question 2.



2. Consider this graph of a firm.
   a. In what market structure does this firm operate? Explain.
   b. What level of output does this firm currently produce? Explain.
   c. At what price does this firm break even?
   d. At what price does this firm earn a profit?

Rubric:

a. 1 point: perfect competition
   1 point: the demand curve is perfectly elastic; demand = marginal revenue
b. 1 point: zero; the firm is not producing any output
   1 point: P < AVC; the firm has shut-down because it cannot cover its variable costs
c. 1 point: P_3
d. 1 point: any price above P_3; OR at P_4