Econ 101 Final Cheat Sheet

Present Value: $PV = \frac{FV}{(1+i)^n}$, Present Value of a Stream: $PV = \sum_{t=1}^{n} \frac{FV_t}{(1+i)^t}$, $PV_{firm} = \pi_0(\frac{1+i}{i-g})$ when FV grows at rate g

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elasticity: $E_{G,S} = \frac{\%\Delta G}{\%\Delta S}$ e.g., own price elasticity of demand: $E_{Q_x,P_x} = \frac{\%\Delta Q_x^d}{\%\Delta P_x} = \frac{\delta Q_x^d}{\delta P_x}\frac{P_x}{Q_x} = \frac{\delta ln Q_x^d}{\delta ln P_x}$

$lnQ_x^d = \beta_0 + \beta_x lnP_x + \beta_y lnP_y + \beta_M lnM + \beta_H lnH$ is log linear demand function, which has own price elasticity: $E_{Q_x,P_x} = \beta_x$ cross-price elasticity: $E_{Q_x,P_y} = \beta_y$ and income elasticity: $E_{Q_x,M} = \beta_M$

Dorfman-Steiner formula: $\frac{A}{R} = \frac{E_{Q,A}}{-E_{Q,P}}$

Budget set: $P_x X + P_y Y \le M$

Marginal product of labor: $MP_L = \frac{\Delta Q}{\Delta L}$ Marginal product of capital: $MP_K = \frac{\Delta Q}{\Delta K}$

Marginal rate of technical substitution: $MRTS_{KL} = \frac{MP_L}{MP_K}$ Cost-minimizing input rule: $\frac{MP_L}{MP_K} = \frac{w}{r}$

The multiproduct cost function: $C(Q_1, Q_2) = f + aQ_1Q_2 + (Q_1)^2 + (Q_2)^2$ has economies of scope exist when $C(Q_1, 0) + C(0, Q_2) > C(Q_1, Q_2)$ and economies of scale when ATC is decreasing in Q_i

Learning curve: average costs decline as cumulative output increases. Usually this appears as a term $-b\,lnZ$, where Z is the sum of all quantities produced since the item first began production.

$C_4 = \frac{S_1+S_2+S_3+S_4}{S_T}$, HHI: $HHI = 10,000\sum w_i^2$, Rothschild index: $R = \frac{E_T}{E_F}$, Lerner Index: $L = \frac{P-MC}{P}$

Markup factor: $\frac{1}{1-L}$

Perfect Competition: many buyers and sellers; homogenous products; max profits when $MC = MR = P$

Short Run Decisions	Long Run Decisions
if Loss < FC, continue to operate	P = MC or P = min AC
if P < AVC, shutdown	zero economic profits
if P $\ge$ $min\ AVC$, continue to operate	

Monopoly: single firm in the market; has price power; can be due to economies or scale or scope (maybe complementarity) or learning curve (natural) or government rules (unnatural); max profits when $MR = MC$ where $MR = P \times \frac{(1+E)}{E}\ for\ E < -1$.

Multi-plant monopoly: where $Q = Q_1 + Q_2$ $MR(Q_1 + Q_2) = MC_1(Q_1)$
$MR(Q_1 + Q_2) = MC_2(Q_2)$

Monopolistic Competition: many buyers and sellers with differentiated products; free entry and exit; in LR, zero economic profit; max profits = MR = MC; in the LR, P > MC and P = ATC > min. average costs

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Sweezy model: firm believes that rivals will match price reduction but not price increases; max profit MR=MC

Cournot Oligopoly: *Formula for Marginal Revenue:* If the (inverse) market demand in a Cournot duopoly is $P = a - b(Q_1 + Q_2)$ where a and b are positive constants, and cost functions are $C_1(Q_1) = c_1Q_1$ and $C_2(Q_2) = c_2Q_2$, then reaction functions are $Q_1 = r_1(Q_2) = \frac{a-c_1}{2b} - \frac{1}{2}Q_2$ and $Q_2 = r_2(Q_1) = \frac{a-c_2}{2b} - \frac{1}{2}Q_1$

Stackelberg Oligopoly: firms set output sequentially; leader set output, leader chooses $Q_1 = \frac{a+c_2-2c_1}{2b}$ because followers will react as Cournot $Q_2 = r_2(Q_1)$

Bertrand model with homogenous goods: MC is constant; each firm sets price; in NE, $P_1 = P_2 = MC$ so economic profits are zero.

Bertrand model with differentiated goods: $P > MC$

Contestable markets: price is driven down to the second lowest AC, due to free entry.

Game Theory: 1. look for dominant strategies / 2. put yourself in your rival's shoes / 3. at the Nash equilibrium, every player is best responding to other players. The Nash equilibrium is a strategy profile in which no player can improve her payoff by unilaterally changing her own strategy, given the other player's strategies. Sustaining cooperative outcomes with trigger strategies:

$\frac{\pi^{cheat} - \pi^{coop}}{\pi^{coop} - \pi^{N}} \le \frac{1}{i}$.

Profit-maximizing **markup for monopol**y and monopolistic competition: $P = [\frac{E_F}{1+E_F}]MC$
Profit-maximizing **markup for cournot oligopoly:** $P = [\frac{NE_m}{1+NE_m}]MC$
Elasticity of demand for an individual product in a Cournot Oligopoly: $E_F = NE_M$
Transfer Pricing Strategy: $NMR_d = MR_d - MC_d = MC_u$

First degree price discrimination: charge each consumer the maximum price he or she would be willing to pay for each unit of the good purchased.
Second degree price discrimination: post a discrete schedule of declining prices for different ranges of quantities (consumers sort themselves)
Third degree price discrimination: charge different groups of consumers different prices for the same product (e.g. student discounts). In 3rd degree PD, the firm should equate the marginal revenue from selling output to each group to marginal cost.

Mean = expected value: the sum of the probabilities q_i that different outcomes will occur, multiplied by the resulting payoffs x_i. $E[x] = q_1x_1 + q_2x_2 + ...q_nx_n$ where $q_1 + q_2 + ...q_n = 1$
Variance: the sum of the probabilities that different outcomes will occur multiplied by the squared deviations from the mean of the random variable.
$Var[x] = \sigma^2 = q_1(x_1 - E[x])^2 + q_2(x_2 - E[x])^2 + ... + q_n(x_n - E[x])^2$
Standard Deviation: the square root of the variance. $\sigma = \sqrt{\sigma^2}$
The most common measure of risk is σ^2 (or just σ). A person i's willingness to pay (or utility) in a risky situation can be written $CE_i[x] = E[x] - \frac{1}{2}r_i\sigma^2$ where r_i is an index of that person's risk aversion.

A risk-neutral manager facing uncertain demand should use this equation when setting output: $E[MR] = MC$

With independent, private valuations, a player's optimal bidding strategy
*In an **English auction** -- remain active until the price exceeds your valuation
*In a **second-price, sealed-bid auction** -- bid your own valuation of the item. This is a dominant strategy.
*In a **first-price, sealed-bid auction** (**Dutch auction)** -- bid less than your valuation of the item. If there are *n* bidders who all perceive valuations to be evenly (or uniformly) distributed between a lowest possible valuation of *L* and a highest possible valuation of *H*, then the optimal bid for a player whose own valuation is *v* is $b = v - \frac{v-L}{n}$.
Winner's Curse: naturally, whoever wins has the most optimistic value of the item up for auction, as they are by definition willing to pay the most for it. The curse is that the winner's estimate of the item's value exceeds the estimates for all the other bidders.
In a **common-values auction** (true value is the same for all bidders, common value is unknown, bidders use their own private information to estimate item's true common value), a bidder should revise downward her private estimate of the value to account for the winner's curse.

When **limit pricing i**s profitable: $\frac{(\pi^L - \pi^D)}{i} > \pi^M - \pi^L$
Direct Network Externalities: a two-way network linking n users provides n(n-1) potential connections. If one new user joins the network, all the existing users directly benefit because the new user adds 2n potential connections.