This review sheet is intended to cover everything that could be on the exam; however, it is possible that I will have accidentally left something off. You are still responsible for everything in the chapters covered except anything that I explicitly say you are not responsible for. Therefore, if I left something off of this sheet, it can still be on the exam. There will be no multiple-choice questions. Most of the questions will be like the ones in the homework assignments, and possibly a few definition questions, but I am more likely to ask questions that make you use the definitions rather than recite them. I will probably ask one of the questions from the book at the end of the chapters.

The review session will be at a time to be determined, probably Thursday, 2/14 in the normal room.

Chapter 1: What are **exogenous variables, endogenous variables, parameters, relationships, equilibrium, statics,** and **dynamics**?

Chapter 2.1: Understand was **sets, subsets,** and **elements** are. Understand set notation and the symbols $\in$, $\subset$, $\supset$, $\subseteq$, $\supseteq$, $\not\subset$, $\not\supset$, $\not\subseteq$, $\not\supseteq$, and $\notin$. Know what $\Leftrightarrow$ means. Be able to draw and interpret **Venn diagrams**. What is the symbol for the **empty set**, a.k.a. **null set**? Know how to find the sets for $\cap$ and $\cup$. What are **disjoint sets**? What is the symbol for the **complement set**? Be able to find the **relative difference of two sets**. Be able to recognize a **partition of a set**.

Chapter 2.2: Now what the following sets are: **Z, Z_+, Q, $\Re$, $\Re_+$,** and $\Re_{++}$. Know the following properties of real numbers: **closure, commutative laws for + and *, associate laws for + and *, distributive law, the properties of zero and one, negation, reciprocals, completeness, transitivity, reflexivity,** and **equality.** Knowing the **dimensions** (**units**) of economic variables will help you to write equations which make economic sense.

Chapter 2.3: Know how to plot an **ordered pair** on the **coordinate system (Cartesian Plain).** Know how to do a **Cartesian product** like {1, 2, 3}⊗{4, 5, 6, 7}. Be able to intervals on a number line like, [1, 4), (-∞, 7], etc. Know the difference between an **open interval, closed interval**, and **half-open interval**. What do **bounded** and **compact** mean? Know how to tell if a set is **convex**. (A line connecting two points is entirely in the set.) Memorize the **Euclidian distance formula** (which is easier than it looks.) Know what an **ε-neighborhood** is. Note that the definitions of a **boundary point**, **interior point**, and **convex set** easier than they look.

Chapter 2.4: Know what **function, domain, range, image,** and **value** are. Be able to tell if the function is **one-to-one, onto,** and/or **one-to-one correspondence.** (The former is the vertical line test, while the middle one is the horizontal line test, and the latter is both tests.) When is a function **invertable**? Know what a **composite mapping** is. Know what is meant by **slope coefficient** and **intercept term** in a **linear function**. An **implicit function** is basically f(x, y)=0. (y is a function of x, but it is not explicitly written out.) Know that **quadratic** functions have a maximum or minimum at $x = -b/2a$ where $y = ax^2 + bx + c$. **Rectangular hyperbolas** are of the form xy=α.. Know how to plot **power functions** ($y = ax^b$) and **exponential functions** ($y=a*b^x$). Know what **logarithmic functions** are including the **natural log**. Note that for all bases (including e so it applies to the natural log ln) that $\log_b(x*y)= \log_b(x)+\log_b(y)$ which means $\log_b(x^a) = a*\log_b(x)$ and $\log_b(x/y) = \log_b(x)-\log_b(y)$. The definitions of **concave** and **convex** are fairly simple (concave looks like a cave so all points on the **secant** are below the line.). Putting **strictly** in front of them means the equality does not hold. For **quasi-concave**, the **better set** of the isobar is convex. For **quasi-convex**, the **worse set** of the isobar is convex. Note that the **Cobb-Douglas** function $f(x,y)=x^a y^b$ normally uses the assumption that a+b<1.

Chapter 3.1-3.2: A **sequence** is a succession of numbers of the form f(1), f(2), f(3), . . . like $f(n) = n^2$ where $n \in Z_+$ or $a_1, a_2, a_3, \ldots$ Know how to tell if it has a **limit**. (For a n >N, $|a_n - L| < \varepsilon$ for an arbitrarily small ε.) If there is no limit, it is **divergent**. **Definitely divergent** if the limit is ∞ or -∞. It is **bounded** if there is a range the values do not exceed for large n. ($|a_n|<K$).

Chapter 3.3: Understand why $PV=FV_t/(1+r/n)^{nt}$ for **discrete compounding** and $FV_t = PV*e^{rt}$ or $PV = FV_t e^{-rt}$ for **continuous compounding**. There will be more of this in Chapter 3.5.

Chapter 3.4: The limits of sequences have nine properties which are very intuitive on Pages 79 and 81. **Monotonically increasing** and **monotonically decreasing** are exactly what you would expect. It is **bounded** if there is both an upper bound and a lower bound.

Chapter 3.5: A **series** is a special type of sequence which is a summation. The standard notation is s_n where a sequence is a_n. If the $s_n = \sum a_t$ and $\lim_{n\to\infty}|a_{n+a}/a_n|=L$, then if L< 1 the series converges, if L > 1, the series diverges, and if L = 1, either could occur. (Check out $a_n = 0$, $a_n = 1$, and $a_n = (-1)^n$. What are s_n and $|a_{n+1}/a_n|$?) The **geometric series** is $s_n = \sum a\rho^t$ converges if $|\rho|<1$ and $\lim_{n\to\infty} s_n = a/(1-\rho)$. This can be used to prove that $PV = FV_\infty/r$ and PV of an payment yearly for n years is $PV = FV_t \left(\frac{1 - \left(\frac{1}{1+r}\right)^n}{1 - \frac{1}{1+r}} \right)$.

The internal rate of return is the value of r which makes the equation equal.

Chapter 5.1 - 5.2: Know what **marginal analysis** means. What is a **tangent line** and how does that relate to the slope of the line? Note that the limit of the slope of the **secant line** as Δx approaches zero is the slope of the tangent line. Know the definitions of **derivative** and **total differential**. Note that marginal cost is the derivative of total cost function.

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1) Suppose there is a geometric series $s_n = \sum a\rho^t$. Assuming $|\rho| <1$ then what is the limit of s_n as $n \to \infty$? Use that to prove that $s_n = a\frac{1-\rho^n}{1-\rho}$

2) Which of the two equations in Question #1 (s_n as $n \to \infty$ or just s_n) is appropriate for the present value of a bond? Explain your logic.

3) Find the limits of the following sequences showing all work and briefly explaining your answers:

$$F(n) = \frac{3 + \frac{4}{n+3}}{1 + \frac{6}{n^2+5}}.$$

$$G(n) = \frac{4 + \frac{1}{n}}{6 + 2n}$$

4) The series for the present value of stock dividends is $PV = \sum_{t=1}^{\infty} \frac{FV_t}{(1+r)^t}$ Find the ratio of a_{n+1}/a_n. Prove that the series converges. What does it converge to? Show all work and briefly explain what you did.