Midterm Items

1. Scientific Book Report:

Instructions: Choose a book BEFORE (Midterm Date). Start from which ever chapter/section you want and read the book for 1 hour. Spend another full hour reporting in hand-written words what you read. Include the following:

1. where you started and where you ended(page numbers)
2. the exact places you got confused with a small explanation as to why
3. an idea that is consistent and/or relative to the text we use in class
4. an idea that is not consistent and/or relative to the text we use in class
5. your own thoughts, ideas, and opinions on what you read

2. Memory Quote, pick one of the three and memorize as much as you can

A) Diffusion of the components of oscillatory chemical reactions can develop chemical concentration waves in initially homogeneous media. In a spherical container, standing concentration waves with $s,p,d,...$ type spatial symmetries can develop. Such reactions make it possible for a fertilized egg to produce a set of identical daughter cells which in a coordinated manner then produce further daughter cells of different types. Subsequent intertwined chains of continuous causality, punctuated by symmetry breaking events, make it possible for "a sphere to become a horse". Even at the few-cell stage where reaction-diffusion phenomena are likely to dominate cell differentiation, the biochemistry involved remains wondrously obscure as this is written.

B) Given a solid ball in 3-dimensional space, there exists a decomposition of the ball into a finite number of non-overlapping pieces, which can then be put back together in a different way to yield *two* identical copies of the original ball. The reassembly process involves only moving the pieces around and rotating them, without changing their shape. However, the pieces themselves are not "solids" in the usual sense, but infinite scatterings of points. A stronger form of the theorem implies that given any two "reasonable" solid objects (such as a small ball and a huge ball), either one can be reassembled into the other. This is often stated colloquially as "a pea can be chopped up and reassembled into the Sun".

C) Any effectively generated theory capable of expressing elementary arithmetic cannot be both consistent and complete. In particular, for any consistent, effectively generated formal theory that proves certain basic arithmetic truths, there is an arithmetical statement that is true, but not provable in the theory. The liar paradox is

the sentence "This sentence is false." An analysis of the liar sentence shows that it cannot be true (for then, as it asserts, it is false), nor can it be false (for then, it is true). A Gödel sentence G for a theory T makes a similar assertion to the liar sentence, but with truth replaced by provability: G says "G is not provable in the theory T." The analysis of the truth and provability of G is a formalized version of the analysis of the truth of the liar sentence.

References:

A) a) A.M. Weinberg, *Growth*, **2** (1938) 81; b) A.M. Weinberg, *Bulliten of Mathematical Biophysics*, **1** (1939) 19; c) A.M. Zapotinsky, Biophysics, **9** (1965) 130-141; d) A.M. Turing, *Phil. Trans. Roy. Soc. London*, **B237** (1952) 37;e) C.E. Wulfman, "Dynamical Symmetry", World Scientific Publishing, (2011);

B) Gödel

C) Kleene 1967, p. 250

3. Study Guide for "Short Easy" quiz

16 of the 32 questions from this study guide slide will be chosen for midterm

Midterm on steadyservpages.com