Math 301 Homework
Donnay, Fall 2009

Assignment #14: Due Wednesday, November 4th at the start of class.

S.1. Let \( f(x) = \sin(x) \) and \( g(x) = \sqrt{x} \). Determine \( f \circ g \) and \( g \circ f \). In each case, what is the domain of the resulting function?

S. 2. Using the open set definition of continuity, prove that if \( f \) and \( g \) are continuous at every point in \( \mathbb{R}^1 \), then \( f \circ g \) is continuous at every point in \( \mathbb{R}^1 \).

Morgan: Ch. 6 #1. For this problem, you can use the results that we have already proven about sequences. However be sure to justify your work by stating clearly what result you are using.

Assignment #15: Due Friday, November 6th at the start of class.

A HW redo problem.

Morgan: Ch. 6 #2. For this problem, you can use the results that we have already proven about sequences. However be sure to justify your work by stating clearly what result you are using.

Ch. 7. #2

S.1. (Practice with independent learning). (A version of #15, Ch. 5). A subset \( S_0 \) of a set \( S \) is dense in \( S \) if every ball about every point of \( S \) contains a point of \( S_0 \). Are the rationals dense in the reals? (Hint: In this example, what is \( S_0 \) and what is \( S \)?)

S. 2. Goal: Solve the equation \( \sin x + 5 - x = 0 \).

a. Step 1: Rewrite the equation in the form \( f(x) = x \). What is the function \( f(x) \)? Graph the functions \( y = f(x) \) and \( y = x \) on the same picture and indicate on the graph where the solution of \( f(x) = x \) is located.

b. Step 2: Choose some initial value \( x_0 \). Then create a sequence by iterating \( f \) so that \( x_{n+1} = f(x_n) \). Using your numerical results, what does \( \lim_{n \to \infty} x_n \) appear to equal? Give your answer to at least 4 decimal places of accuracy.

c. Explain why the limiting value you get in (b) gives the solution to \( \sin x + 5 - x = 0 \).

S. 3. Is the Cantor set open, closed or neither? (Hint: Recall the construction that produced the Cantor set. How was \( C \) defined? ).