CSC 2262 Homework Assignment 2

Rahul Shah rahul@csc.lsu.edu

points 40 Due: 3/2/10 in class

1: Fixed Point Iterations (15 points)

Which of the following fixed point iterations will converge. Why? Give the rate of convergence.
(a) $x = \cos x$
(b) $x = \sin x$
(c) $x = \tan x$
For 10 bonus points, calculate how many iterations are required in (b) for the error to be less than some given value δ.

2: Convergence of fixed point iterations (10 points)

For what range of values of c will the fixed point iteration $x_{n+1} = x_n + c(x_n^2 - 9)$ converge? For what particular value of c will it converge much faster?

3: Multiplicity of roots (15 points)

Consider Newton's method for finding the root of $f(x) = x - \sin x$. Run it on Matlab or a hand calculator to find what is the rate of convergence. i.e., what is the value λ such that $|x_{n+1} - \alpha| = \lambda |x_n - \alpha|$ where α is the root. Find the multiplicity m of this root α.