

### Homework for Chapter 3: Due January 20

1. Solve the equation  $x^3 - \sin x = 0$ , for  $x \neq 0$ , by considering the following fixed point iteration  $g(x) = x$  with:

(a)  $g(x) = \sqrt[3]{\sin x}$

(b)  $g(x) = \frac{\sin x}{x^2}$

(c)  $g(x) = x + \sin x - x^3$

(d)  $g(x) = x - \frac{\sin x - x^3}{\cos x - 3x^2}$

Iterate until you can establish that the method has converged to the solution, or if it is clear that the method will not converge. Explain how you can determine this numerically, and verify that this is consistent with the choice of  $g(x)$ . Make a table that has in its columns each choice of  $g(x)$  and in each row the values of  $x_k$  and  $\mu_k = \frac{x_{k+1} - x_k}{x_k - x_{k-1}}$ , the calculated error ratio, for  $k = 1, \dots, 4$ , plus the last few iterations before you can determine convergence (e.g. n-3,n-2,n-1,n).

2. Solve the same problem using Newton and Secant method. Compare your results. Do you see linear, superlinear, or quadratic convergence? Explain.
3. Problems in book: 3.6 6, 12. Please also make sure to do the review problems (3.6.0) although you should not turn that in.