HW-3

1. Use the Matlab program in sakai that implements the fixed point iteration method $x_{(k+1)}=g(x_k)$ k=1,2,… with a stopping criterion, the $|x_k-x_{(k-1)}|$<tol, and a max number of iterations kmax. Then solve the equation $f(x)=x^2-3x+2$ by using the following iteration functions.
   a. Newton's method for $g(x)=x-f(x)/f'(x)$
   b. $g(x)=(x^2+2)/3$
   c. $g(x)=\sqrt{3x-2}$
   d. $g(x)=3-2/x$
   e. $g(x)=(x^2-2)/(2x-3)$

   Select the initial points by using ezplot to first plot f(x) and identify the regions for the root.

   Do these methods converge, if YES or NOT provide an explanation. If they converge identify the interval of convergence, i.e. any initial starting point in that region will converge to a root.

   What are the rates of convergence for each method? If they converge?

2. We would like to solve $e^{-x}= x$, determine the rate of convergence for Newton's method for points that are farther to the root and points near the root. Will newton's method converge for any starting point? Can you propose a method that is faster than Newton's method?
3. Show that $x_{n+1}=\frac{x_n(x_n^2+3a)}{3x_n^2+a}$ is a third order method for computing $\sqrt{a}$. Implement the above method by modifying Newton's program in sakai. Compare newton's method bisection method and the above third order method for the computation of $\sqrt{5}$ within $eps=10^{-12}$. Write conclusions of your comparison.