AE 2780

Aircraft Design

**Dr. Meeks**

**HW #01**

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**FS 2024**

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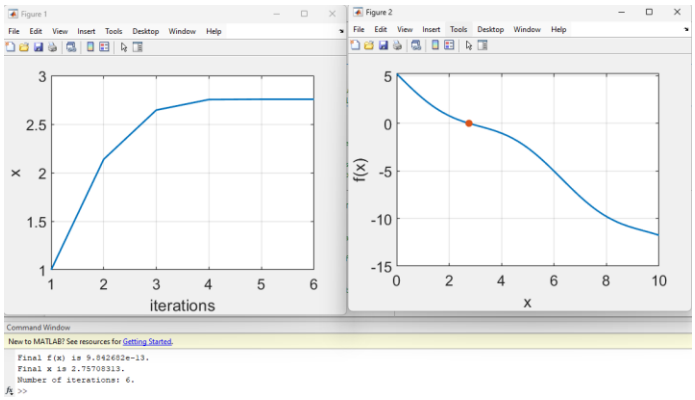
**1.**




**a.** The convergence tolerence is basically how close to zero the function must be before the program stops iterating. At default settings the program will stop iterating once the function is less than $10^{-8}$. (tol)

**b.** The program currently allows up to 1000 iterations before exiting without finding a root (maxiter).

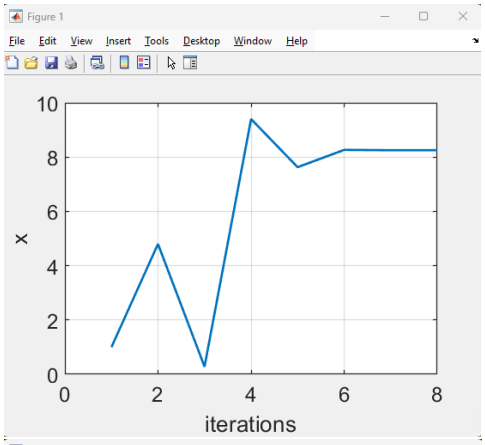
**c.** The boolean operator used to determine when the iterative root solver ends is "while abs(Fx(n1))>tol && n1<maxiter"

**2.** For $2e^{x/8} = 6 + \cos(x)$, $f(x) = 2e^{x/8} - 6 - \cos(x)$

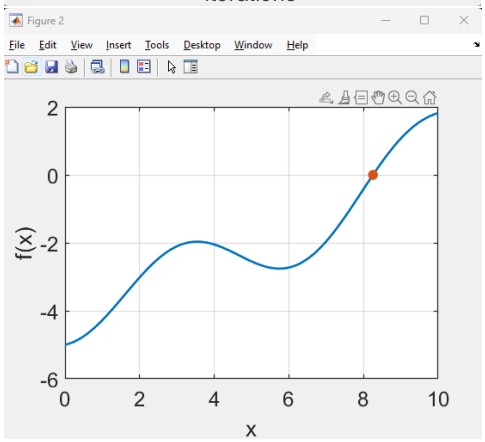
**a.** $f'(x) = \frac{1}{4}e^{x/8} + \sin(x)$

**b.** The root is $x = 8.25315002$ which occurs at $f(x) = -2.911837 \times 10^{-11}$

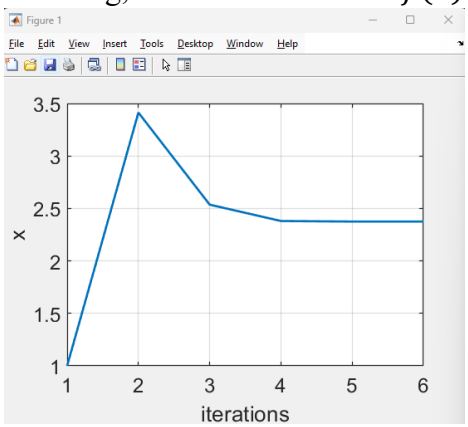
**c.**



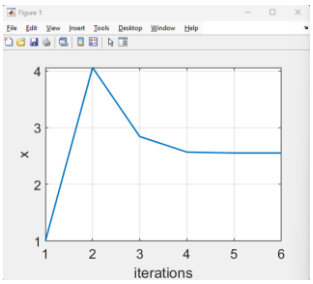

**d.**



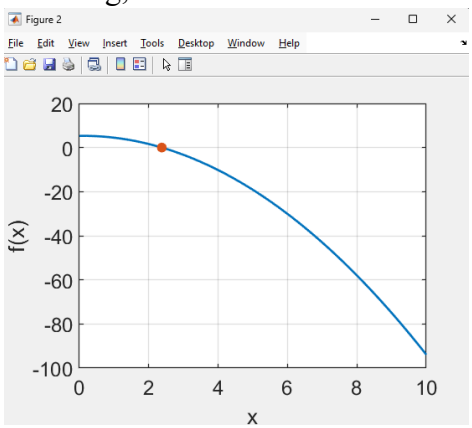
3. **For $\boldsymbol{log(x+2) = x^2 - 5}$, $\boldsymbol{f(x) = log(x+2) - x^2 - 5}$**
   a. $f'(x) = \frac{1}{ln(10)(x+2)} - 2x$ ***ASSUMING log is intended to be log base 10.
      i. OR $f'(x) = \frac{1}{x+2} - 2x$ ***ASSUMING log is intended to be natural log.
   b. For log base 10, $x = 2.37507591$ at $f(x) = -3.679101 \times 10^{-11}$
      i. OR for natural log, $x = 2.55258603$ at $f(x) = -2.697037 \times 10^{-9}$
   c. For log base 10,



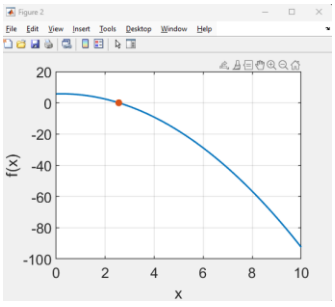

      i. OR for natural log,

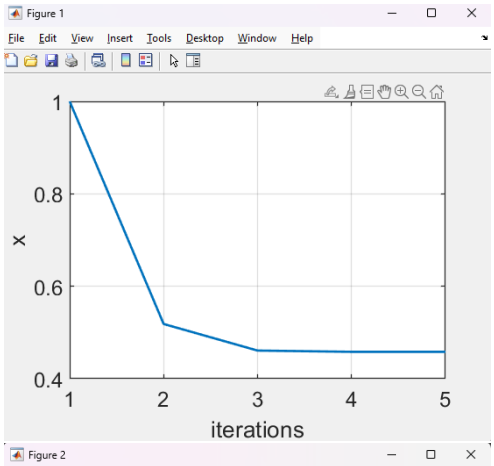



   d. For log base 10,




      i. OR for natural log,



4. **For** $\boldsymbol{sin^2(x) = \frac{1}{5}cos(x^2)}$, $\boldsymbol{f(x) = sin^2(x) - \frac{1}{5}cos(x^2)}$
   a. $f'(x) = 2\sin(x)\cos(x) + \frac{2}{5}xsin(x^2)$
   b. The root is $x = 0.45813816$, which occurs at $f(x) = 3.112166 \times 10^{-11}$
   c. 

   d.