Due Date: Tuesday November 6, 2012

Problem 1. Problem 6.41 in textbook
Problem 2. Problem 6.43 in textbook. Be sure to write out the power flow equations and the Jacobian both analytically/symbolically and numerically for each step of the iteration.
Problem 3. Solve the following equation by the Newton-Raphson method:

\[ 2x_1^2 + x_2^2 = 8 \]
\[ x_1^2 - x_2^2 + x_1 x_2 = 4 \]

Start with an initial guess of \( x_1 = 1 \) and \( x_2 = 1 \) and show work for four iterations. After working out this problem by hand, write a MATLAB script to solve this problem and turn in the code and the output.

Problem 4. This problem requires you to compute a solution in MATLAB again. Consider the system shown in Figure 1, which was discussed in class. First suppose \( V_1 = 1, \theta_1 = 0^\circ, V_2 = 0.95, P_2 = 1.5, \) and \( X_l = 0.2 \) (all in p.u.). Iterate \( \theta_2 \) until it converges using the Newton-Raphson MATLAB code written in Problem 3. Use initial guess of 0\(^\circ\), 60\(^\circ\), and 90\(^\circ\) for \( \theta_2 \) and comment on the results. Note that this is a scalar case of Newton Raphson. Finally, note that in a realistic load bus, the voltage is a variable and is not fixed.

Now consider the more realistic case of having only \( V_1 \) is fixed and \( V_2 \) being a variable. The other parameters are same as above and \( Q_2 = 0.15 \). Find \( \theta_2 \) and \( V_2 \) with initial guesses of 0\(^\circ\) and 1, respectively, using MATLAB (this is a vector case of N-R). Turn in the MATLAB code and the outputs.

\[ \begin{align*}
  &V_1 \angle \theta_1 \\
  &\text{\( jX_l \)} \\
  &V_2 \angle \theta_2 \\
  &P_2, Q_2
\end{align*} \]

Figure 1: System diagram for problem 4.