MATH 373 Numerical Analysis
Homework #1
Assigned: January 24, 2018
Due: February 2, 2018

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1. Develop an M-file for the Bisection Method. Command-line usage is

   ```
   [root,func_val,error_approx,num_iterations] =
   bisection(func,x_min,x_max,error_desired,max_iterations)
   ```

   Program the default values `error_desired = 0.0001` and `max_iterations = 50`. Be sure to follow the template on the website for your code. Your code should be submitted on the MCS website using the **Submit It!** feature.

2. Develop an M-file for the False Position Method. You will need to read §5.5 in order to understand this method. Command-line usage is

   ```
   [root,func_val,error_approx,num_iterations] =
   false_position(func,x_min,x_max,error_desired,max_iterations)
   ```

   Program the default values `error_desired = 0.0001` and `max_iterations = 50`. Be sure to follow the template on the website for your code. Your code should be submitted on the MCS website using the **Submit It!** feature.

3. The secant formula, used to calculate the load that a column can withstand before buckling, is given by

   $$\sigma_{max} = \frac{P}{A}\left[1 + \varepsilon_r \sec\left(\left(\frac{L}{2k}\right)\sqrt{\frac{P}{EA}}\right)\right].$$

   If $\sigma_{max} = 200,000$ MPa/m^2 is the maximum stress for the material used to make the column, $\varepsilon_r = 0.25$ is the eccentricity ratio, $E = 150,000$ MPa is the modulus of elasticity, and $L/k = 30$ is the slenderness ratio, then determine the smallest stress, P/A, that satisfies the secant formula. I recommend using MPa as your units, instead of Pascals, as a way of keeping the numbers smaller. Also, you will probably need to graph this problem in order to determine where the roots are. Finding an interval with a sign change does take a bit of thought.

   Use both Bisection and False Position to solve this problem. Report the outputs for the two methods in a properly formatted table. You do not need to include a plot for this report, but if you do not include a plot, then make sure you address how you determined an interval for your methods. This solution must be typeset using LaTeX and a hard copy should be submitted in class. Be sure to follow the template for homework on the course website.