Math 321

Assignment # 1

Due: Oct 12, 2014

Instructions: You need to

1- **submit** a hardcopy of your codes and results
2- **send** me your m-files (write your name in first line of each file. i.e. %Said Algarni).

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1. Let x be this vector [0.001, 0.1] and $f(x) = e^x$, $g(x) = \sin x$ *and* $h(x) = \frac{1}{1-x}$. Use the following Taylor expansions (approximations) to **approximate** $f(x), g(x) and\ h(x)$:

$$e^x \approx 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!}, \qquad \sin(x) \approx x - \frac{x^3}{3!}, \qquad \frac{1}{1-x} \approx 1 + x + x^2 + x^3 + x^4$$

Now, **find** the relative error for each approximation and then **plot** x versus each relative error using the function LOGLOG. (in one Figure)

2. **Write** a MATLAB code for the **<u>Bisection's Method</u>** and then use it to **find** the solution (accurate to within 10^{-5}) of

$$x - 2^{-x} = 0 \quad for \quad 0 \le x \le 1$$

3. **Write** a MATLAB code for the **<u>Fixed-point Iteration's Method</u>** and then use it to **find** the fixed point (accurate to within 10^{-8}) of

$$f(x) = x - \frac{x^3 + 4x^2 - 10}{3x^2 + 8x} \quad with\ x_0 = 1.5 \ \ and\ N_0 = 20.$$

4. **Write** <u>one</u> MATLAB code for **<u>both Newton's and Secant's Method</u>**s and then use it to **find** the root (accurate to within 10^{-5}) of $\frac{1}{2} + \frac{1}{4}x^2 - x\sin x - \frac{1}{2}\cos 2x = 0$ with
   a. $x_0 = \frac{\pi}{2}$ (for secant's method, use Newton to generate x_1)
   b. $x_0 = 10\pi$. Any observations?