Due: Thursday January 27th, 2005
Problems to be turned in

1. Prove the Theorem stated in class for the fixed point iteration method.
2. Manually convert the following numbers to base 2: 5, 21, 35, 64. Check your conversion with the built-in `dec2bin` function.
3. Convert the following numbers to floating point values with eight-bit mantissas: 0.4, 0.5, 1.5
4. MATLAB has inbuilt variables called `realmax` and `realmin` denoting the largest and the smallest numbers it can store.
   (a) Check that 10*`realmax` generates an overflow while `realmax` + 1 does not. Explain.
   (b) Using MATLAB command window find the largest n such that $n!$ exceeds `realmax`. Briefly describe how you found it.
5. Consider $f(x) = x^3 - 7$. Find a positive root of $f(x) = 0$, with the thelp of a calculator. Now
   (a) Write a m-file function `bisection` that takes in as input a(left end point), b (right end point), n the number of iterations and performs the Bisection method for the above function.
   (b) Starting with the interval $[1, 2]$ perform 3 iterations. Compare your answer to the calculator answer.

Bonus Question[1]

Euler's constant γ is obtained as a limit of γ_n where

$$\gamma_n = \left[1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{n} - \ln n\right].$$

(a) Provide one instance in mathematics where this γ appears.
(b) Consider the use of $\gamma_n - \gamma_{n+1}$ as a convergence tolerance. From the algebraic expression for $\gamma_n - \gamma_{n+1}$ estimate how many terms are necessary to obtain a tolerance of 5×10^{-5}.
(c) Write a m-file function that evaluates γ. Decide whether the above convegence tolerance is a good estimate of the truncation error that will occur.

[1]Not included for this quiz and Not necessary to turn in. Prize: Slice of Black Forest cake for best answer.