NUMERICAL ANALYSIS HW #1

1. Graph the elements of W (2,3,-2,2) on both regular and semilog graphs. What conclusions can you draw?

2. Show that $\sigma = b^{e_{\min}-1}$ and that $\lambda = b^{e_{\max}}(1-b^{-t})$.

3. Find the largest value of a such that $\frac{1}{1+a} \approx 1-a$. Before you proceed, you must decide how you are going to define "≈". Does the approximation hold uniformly from that point on? i.e., let a_0 be the value determined above. Is it true that for all $a < a_0$ that the approximation still holds?

4. The sun subtends an angle at the earth of 32'4". The distance to the sun is approximately 92 million miles. Estimate the diameter of the sun. Find the currently accepted distance to the sun and recalculate the diameter of the sun. What is the error in using the 92 million mile estimate for the distance to the sun?

5. Using the data from (4), how far must the eye be from a penny so as to just hide the sun? A penny is 3/4 of an inch in diameter.

6. A railroad is inclined 53' above the horizontal. How many feet does the track rise in one mile?

7. The tangent of the sum of two angles x and y is $\tan(x+y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}$. Investigate the behavior for this sum when $x \approx \frac{\pi}{2}$ and $y \approx 0$.

8. For any $x_0 > -1$, the sequence defined recursively by $x_{n+1} = 2^{n+1}[\sqrt{1+2^{-n}x_n} - 1]$ converges to $\ln(x_0+1)$. What can you say about the conditioning of the function in the brackets for large n? Arrange this formula in a way that avoids loss of significance.