Math 101, Littlefield
Homework: Solving Exponential Equations

Task: Using two different methods (symbol manipulation and Goal Seek in spreadsheet), solve the following problems:

1. $4^x = 3$ (solve for x)
2. $6^{-t+1} = 22$ (solve for t)
3. $6^{m+3} = 4^m$ (solve for m)

Deliverables:
1. Symbolic solution (paper and pencil)
2. Excel spreadsheet that
   a. evaluates the symbolic solution
   b. Goal-Seeks for a numeric solution, working directly from the original equation. (Hint: the numeric answer from Goal-Seek should be very close to the value that you get by evaluating the symbolic solution!)
3. Printouts of the Excel spreadsheet showing <u>formulas</u> and <u>values.</u>

Example: Suppose you were given $9^{-x+2} = 13$, to be solved for x

The symbolic solution goes like this.

- $9^{-x+2} = 13$ given
- $\log(9^{-x+2}) = \log(13)$ take logs of both sides
- $(-x+2) \cdot \log(9) = \log(13)$ rewrite left side using "log of a power" rule
- $(-x) \cdot \log(9) + 2 \cdot \log(9) = \log(13)$ expand left side using distributive law
- $(-x) \cdot \log(9) = \log(13) - 2 \cdot \log(9)$ subtract $2 \cdot \log(9)$ from both sides
- $x \cdot (-\log(9)) = \log(13) - 2 \cdot \log(9)$ refactor left side (move minus sign)
- $x = \dfrac{(\log(13) - 2 \cdot \log(9))}{(-\log(9))}$ divide both sides by $(-\log(9))$

The spreadsheet would look like this:

	A	B	C	D	E	F	G	H	I
1	Problem 7, solve 9^(-x+2) = 13								
2									
3	Symbolic solution, x = (log(13)-2*log(9))/(-log(9))								
4	Value	0.83264124							
5									
6	Solution by Goal-Seeking			x					
7				0.832649					
8			Left Side	Right Side	Ratio				
9	9^(-x+2) = 13		12.99977	13	0.999982	<--- Goal Seek E9 to 1 by changing D7			

	A	B	C	D	E	F
1	Problem 7, solve 9^(-x+2) =					
2						
3	Symbolic solution, x = (logi					
4	Value	= (LOG(13)-2*LOG(9))/(-LOG(9))				
5						
6	Solution by Goal-Seeking			x		
7				0.832649319189903		
8			Left Side	Right Side	Ratio	
9	9^(-x+2) = 13		=9^(-D7+2)	13	=C9/D9	<--- Goal Seek E9 to