

Hints for Homework 8

1. (Low-rank approximation using SVD; image compression) Follow the demo given in the last 15 minutes of Lecture 23; the accompanying live script is found under Lecture 21. Be sure to download the image file ([hubble_gray.jpg](#)) to the directory where your main homework live script file resides.
2. (Annuity with `fzero`)
3. (Lambert's W function) Since $y = W(x)$ if and only if $x = ye^y$, y is a root of the function $f(y) = x - ye^y$ for a given x . Once framed in this way, it is clear what to do with `fzero`.

Note. For a given $x \in [0, 4]$, use $x_0 = (-1 + \sqrt{1 + 4x})/2$ as an initial iterate.

Note. MATLAB actually has a built-in function for Lambert's W function; it is named `lambertw`. You may test your code against it. As always, read the documentation using `help lambertw`. You can also read the source code for this function by typing `type lambertw.m` in the Command Window!

4. (Fixed-point iteration)
 - (a) Theorem 3 (Convergence of FPI) from [Lecture 25](#) is useful.
 - (b) Find a relevant example from the [live script accompanying Lecture 25](#).
5. (Convergence of Newton's method)
 - (a) Begin by carefully calculating (by hand) $f'(x)$. Then substitute it into the Newton's iterative formula
$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)},$$
and go from there.
 - (b) Follow the instruction and mimic the series analysis presented on p. 18 of [Lecture 25](#).