Math 155, Vese

Homework # 3  Due on Wednesday, May 12

[1] Show that the Fourier transform and its inverse are linear processes.

[2] Compute in continuous variables the Fourier transform of the function defined by:

\[ f(x) = \begin{cases} 
A, & \text{if } 0 \leq x \leq K, \\
0, & \text{otherwise}, 
\end{cases} \]

where \( A \) and \( K \) are positive constants. Evaluate \( F(0) \).

[3] Show that if a filter transfer function is real and symmetric (i.e. if \( H(u, v) = \overline{H(u, v)} = \overline{H(-u, -v)} = H(-u, -v) \)), then the corresponding spatial domain filter \( h(x, y) \) is also real and symmetric.

[4]  
(a) Implement the Gaussian lowpass filter in Eq. (4.3-8), using a radius=15, and apply the algorithm to the attached image.  
(b) Highpass the input image used in (a), using a highpass Gaussian filter of radius \( D_0 = 15 \).