Q4)

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Laplacian of an image, is its convolution with the matrix $\begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{bmatrix} = L$.

Thus we can get the laplacian by taking IFT of the product of DFT's of the image, and filter matrix L.

Magnitude of image gradient is $\sqrt{g_x^2 + g_y^2}$.

where $g_x = \frac{\partial f}{\partial x}$, $g_y = \frac{\partial f}{\partial y}$. f is intensity at that point in the image.
(gradient in x direction).

Now, we find $\frac{\partial f}{\partial x}$ of an image by convolving it with the filter $A = [1 \; 0 \; -1]$.

Thus to get g_x, we take the IDFT of the product between DFT of A and DFT of the image given to us.

To get g_y, we convolve image with filter $B = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$.

Thus to get g_y, we take IDFT of product of DFT of matrix B, and DFT of the image given to us.

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Once we have found both g_x and g_y using Fourier transforms, we simply calculate gradient magnitude at each pixel by doing $\sqrt{g_x^2 + g_y^2}$.

Hence we can find gradient magnitude at every pixel using fourier transforms.