1. *Please use Python to write your own convolution code that applies the following filters (kernels) to this image (link). You need to use the convolution step as 1 and the reflection padding to keep the convolution output the same size as the input image. (1 point)*

Filter 1: $\begin{bmatrix} -1 & -1 & -1 \\ -1 & 4 & -1 \\ -1 & -1 & -1 \end{bmatrix}$

Filter 2: $\begin{bmatrix} -1 & 0 & -1 \\ 0 & 4 & 0 \\ -1 & 0 & -1 \end{bmatrix}$

2. *What is your observation of the convolution results? Can you explain the reason? (1 point)*

1. Convolution done. Code in the convolution.py file.

Original   Kernel/Filter 1   Kernel/Filter 2
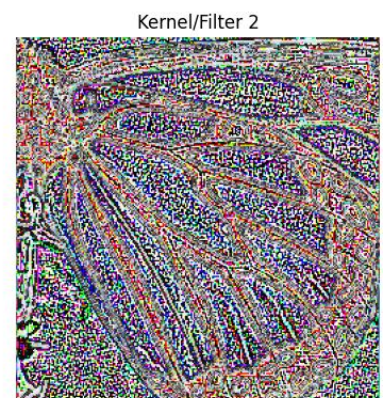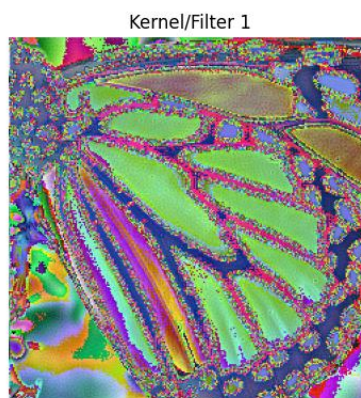
2.
The observation I have made is that in:

   a. The first kernel/filter (1) the image is taken and sharpened, it shows contrasts and where edges and colours quickly change.
   b. The second kernel/filter (2) the image is sharpened further in a different way and lines/patterns begin to form. This filter emphasizes vertical and horizontal edges.

I'd say that the second one is much more useful for looking for lines if we had to have a machine learn from it. It might look a little weird, but the lines are more contrasted. The first one looks like it could be used more for contrasts (general feature detection?). The first filter also doesn't discriminate with lines, and treats diagonal lines equally with horizontal and vertical lines. Neither is "better", they are both used for different tasks.