HW 6 Written Questions

1. bilateral filter vs. standard linear convolutional filter
A standard linear convolution filter just applies a kernel to each pixel in an image. Although this is simple, it often blurs sharp edges.
The solution to this is bilateral filtering where there is a penalty for having too different intensity from the center pixel/pixel being processed. Since neighboring pixels contribute differently to the pixel being process, normalization must be performed to ensure that certain pixels don't appear especially bright or dark. Calculating this normalization factor is more computationally expensive because you can have to consider intensity difference and spatial distance from neighboring pixels.

2. Even though it would be able to display on a classical monitor, by just normalizing it that way will destroy high frequency details in the image.
Also for example if the image is in a very dark scene but there is a small light somewhere in the image, by just using the simplest tone mapping will cause the dark parts of the scene to be super dark because it is normalizing by finding the brightest and darkest pixel in the image.

3. A pixel is the smallest non-splittable particle used to compose an image. A pixel is the smallest part of any image. However, depending on how the picture is taken or rendered, it could represent the light coming from a large region of space.

4.

a. This kernel simply moves the whole image down by 1 pixel.

b. This kernel averages each pixel by looking at surrounding pixels which blurs the image. The values in the middle column are larger which suggests that this is a tent kernel. Tent kernel is smoother than simple box kernel.

c. This kernel takes the derivative of an image in the vertical direction. This would produce a image where horizontal edges will have high intensity (kind of like edge detector) while untextured parts and parts with little change will have low intensity.

5.

HSV stands for hue, saturation, value

Hue: represents which type of color (0 to 360 degrees)

Saturation: represents the intensity/purity of the color (0 to 100%)

Value: brightness of the color (0% to 100%)