Module 3: Answers

1. Apply the horizontal Sobel edge detector to the following image patch. Use border values to extend the image where necessary.

```
10 | 20
-------
30 | 40
```

Answer

```
-80 | -80
---------
-80 | -80
```

2. Apply the averaging blur filter to the following image patch. Use border values to extend the image where necessary. Round output values to nearest integer.

```
10 | 20
-------
30 | 40
```

Answer

```
16 | 23
-------
27 | 30
```

3. Name the advantages and disadvantages of processing images at a higher resolution.

Advantages: more information, higher quality picture

Disadvantages: slower, more processing

4. Threshold the following grayscale image using 127 as the threshold.

```
50 | 100
-------
150 | 200
```

Answer

```
0 | 0
-----
1 | 1
```

5. Apply the Gaussian blur filter to the following image patch. Use border values to extend the image where necessary. Round output values to the nearest integer.

```
10 | 20
-------
30 | 40
```

Answer

```
14 | 21
-------
20 | 36
```

6. All the lines running through a single point in Cartesian become what in the Hough space?

A curve

7. In Hough space, how are likely lines selected?

When curves intersect in Hough space, this corresponds to lines that run through multiple points in Cartesian space. The (r,theta) parameters at the intersection are likely lines in the image.

8. What does the zeroth order spatial moment represent?

It represents the area of a segmented object.

9. What is meant by 24-bit color?

Each color channel is represented by 8-bit (1 byte). There are 3 color channels: Red, Green, and Blue.

10. How can a color image be converted to grayscale?

Average the RGB values for each pixel. The averaged value is the grayscale value for the pixel.