

## Exercise

Please hand in this paper to the instructor before the end of the lecture.

Name: \_\_\_\_\_

Student number: \_\_\_\_\_ Date: \_\_\_\_\_

**Q.** Consider a 2D camera coordinate system whose x-axis is  $(0.707, 0.707)$  and y-axis is  $(-0.707, 0.707)$  in the world coordinate. Write down the matrix that we can use to convert a world point  $(x, y)$  into the camera coordinate system.

**Q.** Consider a 1D image  $\mathbf{I}$  with  $N$  pixels. A filter  $\mathbf{f}$  is applied to this image and the resulting image has  $N - 16$  pixels. What is the *half-width* of filter  $\mathbf{f}$ .

**Q.** Consider a single pixel RGB video. This video has 5 frames as seen below (each column corresponds to a frame).

	frame 1	frame 2	frame 3	frame 4	frame 5
red	1	2	1	1	5
green	4	3	0	0	9
blue	1	2	4	2	5

Write down the  $3 \times 3$  covariance matrix for the RGB values observed in this video. Also, write down the mean red, green, and blue values.