Exercise 2

Part 1 :

- The first part represents a test case for a camera model which verifies whether the projection and unprojection operations are working correctly for the points in the specified range.
- It normalizes a 3D point and projects it to get a 2D point. This 2D point is then unprojected to a 3D point and compared to the normalized 3D point. If they are not approximately equal, it throws an error and that test case is not passed.
- This function is then applied to different camera models , like Pinhole, Extended Unified, Double Sphere and Kannala Brandt models in order to test their projection and unprojection functions.

Part 2 :

- The main difference between curve fitting and robust curve fitting is how they deal with outliers.
- Purpose of curve fitting is to fit a model to some given data. But the problem of traditional curve fitting is that it is sensitive to noise/outliers which can have a big impact on the result.
- In robust curve fitting, it accounts for the presence of outliers by introducing a loss function in the residual block for eg - Cauchy loss. This limits the effect of outliers on the least square fit thereby not affecting the result as much.

Part 3 :

- The command line parameters that it uses are :
    1. “--show-gui” : Whether or not to show the GUI.
    2. “--dataset-path” : Path to the dataset containing the images and calibration data.
    3. “--cam-model” : Specifies which camera model to be used. It can be Pinhole, extended unified, double sphere or kannala brandt.

- Calibration Results :
    - All the camera models except the pinhole camera model seemed to calibrate very well to the given data.
    - A quantitative measure to compare their performance would be to calculate their reprojection errors and compare them.