

#### Part I

- 1) c. an M-estimator
- 2) c. bias and gain
- 3) b. multiplication
- 4) c. radial distortion
- 5) d. vanishing
- 6) d. full 360° panorama
- 7) b. radial distortions

#### Part II

- 1) warped coordinates:  $x' = 1.25$ ,  $y' = 0.76$

scale factor:  $s = f = 1$

formula for projecting from warped coordinates to initial coordinates:

$$x' = x/s, y' = y/s$$

$$\text{since } s = 1, x = x' \cdot s = 1.25 \cdot 1 = 1.25$$

$$y = y' \cdot s = 0.76 \cdot 1 = 0.76$$

therefore, the initial coordinates are:  $(x, y) = (1.25, 0.76)$

2) K-means clustering iteratively assigns points to clusters and updates the centroids until convergence. While it may not always reach a global minimum of the objective function, it always reaches a local minimum due to cluster Assignment Step: In each iteration, data points are assigned to the nearest centroid. This step always decreases the objective function. Hence, it will eventually converge to a configuration where neither reassigning points to clusters nor updating centroids can further reduce the objective function. At this point, the algorithm is stuck at a local minimum.

3) Cutting the first and last few pixels from the line point list when performing incremental line fitting improves stability because the first and last few pixels in a list may belong to corner regions rather than the line itself. Including corner pixels may cause overfitting, where the line is fit to accommodate corner-related distortions, leading to poor results. Excluding the first and last pixels ensures the line is fit to the more stable