Use of your own calculator allowed. No literature. You can keep this exam paper also after exam.

Perform all Problems 1-3 below. Each of them is worth of 4 points.

Problems:

1. Answer briefly to the following questions:

(a) Mention five different real-world applications of machine learning. (1p.)

(b) Mention one real-world application of machine learning which does not yet exist (at least not in a wide every-day use). (1p.)

(c) What is PROLOG based on? (1p.)

(d) What is meant by reinforcement learning? (1p.)

2. Using hierarchical down-to-top clustering method with Euclidean similarity measure, cluster the following 2-dimensional data into two clusters. Draw the resulting dendrogram. (4p.)

$$D = \{(0,0), (2,2), (2,3), (1,0), (0,-1), (1,-1)\}$$

Hint: You can just draw the points in the (x,y) coordinate system and approximate by eye the distances. Use average linkage principle (just by eye again; no calculations needed) to merge points/clusters.

3. Explain (using approx. 50-100 words) the following figure. Which size is the most optimal? (4p.)