

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531***. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. (5 marks) Find the distance between the line $\mathcal{L} : (x, y, z) = (1, 3, 0) + t(4, 3, 1)$ and the y-axis.

Question 2. Given two planes:

$$\mathcal{P}_1 : x + z = 1$$

$$\mathcal{P}_2 : y + z = 1$$

- a. (1 mark) Give a point of intersection of the two planes, by inspection.
- b. (1 mark) Give a geometrical argument to explain why the intersection of the two planes is a line.
- c. (2 marks) Find the direction vector for the intersection of the two planes without solving for the solution set. Justify.
- d. (1 mark) Find the solution set of the system of linear equations determined by \mathcal{P}_1 and \mathcal{P}_2 by only using part a) and part c).

Bonus Question. (3 marks) Given a Yann plane segment defined as $\mathbf{x} = (1, 0, 2) + s(1, 1, 1) + t(2, 1, 3)$ where $(s, t) \in [-1, 2] \times [-2, 0]$. Find the area of the Yann plane segment.