

## Quiz 10

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

**Question 1.** 4.4 (5 marks) Determine whether the given pair of lines has a point of intersection; if so, determine the scalar equation of the plane containing the lines, and if not, determine the distance between the lines.

$$\vec{x} = (1, 3, 1) + s(-2, -1, 1) \text{ and } \vec{x} = (0, 1, 7) + t(3, 0, 1), \quad s, t \in \mathbb{R}$$

**Question 2.** (5 marks) §4.1 #2 Let  $V$  be the set of all ordered pairs of real numbers, and consider the following addition and scalar multiplication operations on  $\vec{u} = (u_1, u_2)$  and  $\vec{v} = (v_1, v_2)$ .

$$\vec{u} + \vec{v} = (u_1 + v_1 + 1, u_2 + v_2 + 1) \quad k\vec{u} = (ku_1, ku_2)$$

- a. Compute  $\vec{u} + \vec{v}$  and  $k\vec{u}$  for  $\vec{u} = (0, 4)$  and  $\vec{v} = (1, -3)$ , and  $k = 2$ .
- b. Show that  $(0, 0) \neq \vec{0}$ .
- c. Show that  $(-1, -1) = \vec{0}$ .
- d. Show that Axiom 5 holds by producing an ordered pair  $-\vec{u}$  such that  $\vec{u} + (-\vec{u}) = \vec{0}$  for  $\vec{u} = (u_1, u_2)$ .
- e. Find two vector space axioms that fail to hold.