

Dr. Z's Math251 Handout #13.1 (2nd ed.) [Vector-Valued Functions]

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**Problem Type 13.1a:** Find a vector equation and a parametric equation for the line segment joining  $P(p_1, p_2, p_3)$  and  $Q(q_1, q_2, q_3)$

**Example Problem 13.1a:** Find a vector equation and a parametric equation for the line segment joining  $P(1, 0, 1)$  and  $Q(2, 3, 1)$

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**Steps**

**Example**

1. The vector equation for the line segment joining  $P$  and  $Q$  is  $(1 - t)P + tQ$  ( $0 \leq t \leq 1$ ), i.e.

$$(1-t)\langle p_1, p_2, p_3 \rangle + t\langle q_1, q_2, q_3 \rangle, \quad (0 \leq t \leq 1)$$

1.

$$(1 - t)\langle 1, 0, 1 \rangle + t\langle 2, 3, 1 \rangle =$$

$$\langle 1-t, 0, 1-t \rangle + \langle 2t, 3t, t \rangle = \langle 1+t, 3t, 1 \rangle,$$

$$(0 \leq t \leq 1)$$

2. After you simplify  $tP + (1 - t)Q$  read-off the three components,  $x, y, z$ .

2.

$$\langle x, y, z \rangle = \langle 1 + t, 3t, 1 \rangle,$$

So

$$x = 1+t, \quad y = 3t, \quad z = 1 \quad (0 \leq t \leq 1)$$

This is the **Ans.**