

### Quiz 3 for Math114, 2009 - 205, 206

1. Find the volume of the parallelepiped determined by the vectors  $a$ ,  $b$  and  $c$  when

$$a = i + j - k, \quad b = i - j + k, \quad c = -i + j + k.$$

**Ans.**

$$b \times c = \begin{vmatrix} i & j & k \\ 1 & -1 & 1 \\ -1 & 1 & 1 \end{vmatrix} = -2i - 2j + 0k$$

$$a \bullet (b \times c) = \langle 1, 1, -1 \rangle \bullet \langle -2, -2, 0 \rangle = -2 - 2 = -4$$

Thus,

$$V = |a \bullet (b \times c)| = |-4| = 4.$$

2. Find the equation for the line through the points  $(1, 3, 2)$  and  $(-4, 3, 0)$ .

**Ans.** The direction vector of the line is

$$\vec{d} = \langle 5, 0, 2 \rangle$$

So, the line equation is

$$\frac{x-1}{5} = \frac{z-2}{2}, \quad y=3$$

or

$$\begin{aligned} x &= 1 + 5t, \\ y &= 3 \\ z &= 2 + 2t \end{aligned}$$

*Note that you can use the other point  $(-4, 3, 0)$  or direction vector  $\vec{d} = \langle -5, 0, -2 \rangle$  to get the line equation, and they all represent the same line.*