

5. (There is no partial credit for this problem. Make sure your answer is correct.) Find the equations of the line through $(5, 2, 4)$ and $(2, 4, 7)$.

$$\vec{PQ} = -3\vec{i} + 2\vec{j} + 3\vec{k}$$

$$\frac{x-5}{-3} = \frac{y-2}{2} = \frac{z-4}{3}$$

Check at P $0=0=0 \checkmark$

at Q $\frac{-3}{-3} = \frac{2}{2} = \frac{3}{3} \checkmark$

6. Do the following lines intersect? If so, find their point of intersection.

$$\frac{x+1}{-1} = \frac{y-10}{3} = \frac{z-10}{2} \quad \text{and} \quad \frac{x-4}{1} = \frac{y-5}{2} = \frac{z+8}{-6}$$

The first line is $x = -t-1$, $y = 3t+10$, $z = 2t+10$.

We find t so that a creature walking along the 1st also is on the second line

$$\frac{-t-1-4}{1} = \frac{3t+10-5}{2} = \frac{2t+10-5}{-6}$$

$$\text{So } -t-5 = \frac{3t+5}{2} = \frac{2t+18}{-6}$$

$$\text{So } \begin{cases} -t-5 = \frac{3t+5}{2} \\ -t-5 = \frac{2t+18}{-6} \end{cases}$$

$$\text{So } \begin{cases} -2t-10 = 3t+5 \\ 6t+30 = 2t+18 \end{cases}$$

$$\text{So } \begin{cases} -15 = 5t \\ 4t = -12 \end{cases}$$

$t = -3$ works both equations
so the intersection is

$$(2, 1, 4)$$

Check
 $(2, 1, 4)$ is on the 1st line because

$$\frac{3}{-1} = \frac{1-10}{3} = \frac{4-10}{2} \quad \text{all} =$$

$(2, 1, 4)$ is on the 2nd line because

$$\frac{2-4}{1} = \frac{1-5}{2} = \frac{4+8}{-6} \quad \text{all} =$$