Math 2163

Jeff Mermin's section, Quiz 1, August 25

1. **(2 points each)** Indicate whether the following statements are true or false. ("True" means "Always true", "false" means "sometimes false" or "possibly false".) No justification is necessary. Write out the whole word "true" or "false".

   On these problems, a and b are numbers, $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ are vectors in $\mathbb{R}^3$, and x, y, and z are the usual coordinates in $\mathbb{R}^3$.

   (a) $(\mathbf{u}+\mathbf{v})+\mathbf{w} = \mathbf{u}+(\mathbf{v}+\mathbf{w})$.

   (b) $\mathbf{u}\bullet\mathbf{v} = \mathbf{v}\bullet\mathbf{u}$.

   (c) $|\mathbf{u}\bullet\mathbf{v}| \leq \|\mathbf{v}\|\,\|\mathbf{w}\|$

   (d) The equations $x = 2$, $y = -1$, $z = 0$ define a line in $\mathbb{R}^3$.

   (e) $(a+b)\mathbf{u} = a\mathbf{u}+b\mathbf{u}$.

2. **(4 points)** Find a (vector) equation describing the line through $P = (4,5,0)$ and $Q = (-3,4,0)$.

3. **(2 points)** Find two points on the line with vector equation

$$(x, y, z) = (2, -1, 1) + \langle -2, -2, 4 \rangle t.$$

4. **(4 points)** Let $\mathbf{v} = \langle 1, -1, 3 \rangle$ and $\mathbf{w} = \langle 1, 2, 5 \rangle$.

   (a) Compute $\mathbf{v} \bullet \mathbf{w}$.

   (b) Is the angle between $\mathbf{v}$ and $\mathbf{w}$ acute, right, or obtuse?

Extra Credit **(3 points)**: Do the lines

$$\ell : (x, y, z) = (1, -2, 5) + \langle 1, 4, 1 \rangle t$$

and

$$m : (x, y, z) = (-3, 5, 5) + \langle -1, -3, 3 \rangle t$$

intersect? If so, what is their point of intersection?