Review for quiz 1

We have our first quiz next Friday, January 30. The quiz will have 3 or 4 problems which will look like a subset of the following problems.

If you have questions about any of the problems on this sheet, you can use the Reply on Discourse button down below.

The problems

1. Let S denote the sphere of radius 2 centered at the point $(1, 2, 3)$.

   a. Find an equation of that sphere.
   b. I guess the intersection of S with any plane should be either empty, a single point, or a circle. Which of those is it for each of the coordinate planes?

   Note: Spheres and the coordinate planes are covered in sections 11.1.2 and 11.1.3 of our text.

2. Find a real number t that makes the vector $\langle t + 1, 2t + 1, 1 - 4t\rangle$ perpendicular to the vector $\langle 1, 1, 1\rangle$.

3. Let $\vec{u} = \langle 4, 1\rangle$ and let $\vec{v} = \langle 1, 2\rangle$.

   a. Draw the two vectors $\vec{u}$ and $vecv$ emanating from the same point, together with the vector $\text{proj}_{\vec{u}}\vec{v}$.
   b. Write down $\text{proj}_{\vec{u}}\vec{v}$ as a vector in terms of its components.

   Note: Orthogonal projection is defined in Definition 11.3.14 of our text.

4. Find an equation of the plane containing the three points $(1, 1, -1)$, $(1, 0, 0)$, and $(2, 3, 3)$.

   Note: Example 11.6.3 in our text is quite similar to this.

5. Write down a componentwise proof that the dot product is distributive over the addition of two-dimensional vectors - i.e.,

$$\vec{u} \cdot (\vec{v} + \vec{w}) = \vec{u} \cdot \vec{v} + \vec{u} \cdot \vec{w},$$

for all 2D vectors $\vec{u}$, $\vec{v}$, and $\vec{w}$.

Note: A similar problem is solved on our forum.