Question Set 2

CS 320

Chapter 2

1. Identify the types (basis, coordinate vector, matrix, point, vector) of the variables in this equation
$$\vec{v} = \vec{\mathbf{b}}^t M^{-1}\mathbf{c}$$

2. Draw a figure corresponding to
$$\vec{\mathbf{b}}^t\mathbf{c} \Rightarrow \vec{\mathbf{b}}^t M\mathbf{c}$$
and express this mathematical statement in words.

3. Draw a figure corresponding to
$$\vec{\mathbf{b}}^t \Rightarrow \vec{\mathbf{b}}^t M$$
and express this mathematical statement in words.

4. If
$$\vec{v} \cdot \vec{w} = 0$$
then what do we know?

5. Define the term *3D orthonormal basis*.

6. How is the vector
$$\vec{v} \times \vec{w}$$
related to the two vectors in the expression?

7. Which of the following are valid expressions in our notation and, if valid, what is the resulting type (invalid, basis, coordinate vector, matrix, point, vector)
   (a) $\vec{\mathbf{b}}^t M$
   (b) $\mathbf{c}M$
   (c) $M^{-1}\mathbf{c}$
   (d) $\vec{\mathbf{b}}^t N M^{-1}\mathbf{c}$

8. Given that $\vec{\mathbf{a}}^t = \vec{\mathbf{b}}^t M$, what are the coordinates of the vector $\vec{\mathbf{b}}^t N\mathbf{c}$ with respect to the basis $\vec{\mathbf{a}}^t$? (Your answer will be a mathematical expression.)

9. Given that the transformation $\mathcal{T}(\vec{v})$ is defined as $\mathcal{T}(\vec{v}) = \vec{v} + \vec{k}$, show that $\mathcal{T}(\vec{v})$ is not a linear transformation.