

CS 230, Quiz 1

Solutions

You will have 5 minutes to complete this quiz. There is a problem on the back. No books, notes, or other aids are permitted.

Problem 1

Using the definitions for \mathbf{u} , \mathbf{v} , and \mathbf{A} , compute the quantities below. If the quantity does not exist, state this and very briefly explain why (a few words is enough). Note that manipulating some of them can make them easier to compute.

$$\mathbf{u} = \begin{pmatrix} 1 \\ -2 \\ 0 \end{pmatrix} \quad \mathbf{v} = \begin{pmatrix} 3 \\ 0 \\ 0 \end{pmatrix} \quad \mathbf{A} = \begin{pmatrix} 1 & 2 \\ 0 & 0 \\ 0 & 7 \end{pmatrix}$$

(a) Compute: $(2\mathbf{u}) \cdot \mathbf{v} - \mathbf{v} \cdot (3\mathbf{u})$

(b) Compute: $(\mathbf{u} \times \mathbf{v}) \cdot \mathbf{u}$

(c) Compute: $\mathbf{A}\mathbf{u}$

(d) Compute: $\mathbf{A}^T\mathbf{u}$

(e) Compute: $\mathbf{u} \times \mathbf{v} - \mathbf{u} \cdot \mathbf{v}$

Solutions:

(a): $(2\mathbf{u}) \cdot \mathbf{v} - \mathbf{v} \cdot (3\mathbf{u}) = -\mathbf{u} \cdot \mathbf{v} = -((1)(3) + (-2)(0) + (0)(0)) = -3$

(b): $(\mathbf{u} \times \mathbf{v}) \cdot \mathbf{u} = \mathbf{0}$ (The cross product of two vectors is orthogonal to both of them.)

(c): Does not exist (dimensions do not match up)

(d): $\begin{pmatrix} (1)(1) + (0)(-2) + (0)(0) \\ (2)(1) + (0)(-2) + (7)(0) \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

(e): Does not exist. The cross product is a vector; the dot product is a scalar.

Problem 2

For most applications, only three colors are required to reproduce nearly all colors. For type-A applications, the colors used are red ■, green ■, and blue ■. For type-B applications, the colors used are yellow ■, magenta ■, and cyan ■. For each application below, identify it as “A” or “B” based on the colors it should use. No explanation is needed.

- (a) Color printer
- (b) Overhead projector
- (c) Food coloring (dyes added to foods to change their color)
- (d) LED computer screen
- (e) LCD computer screen

Type-A applications are ones that emit light: (b), (d), and (e). Type-B applications are ones that absorb light: (a) and (c).