Name: _____

DATA 470 — Fall 2025

Quiz #1

Aug. 28, 2025

1. A vector has:

   - ◯ A direction, a magnitude, and a starting point
   - ☑ A direction and a magnitude
   - ◯ A direction and a starting point
   - ◯ A magnitude and a starting point
   - ◯ A direction
   - ◯ A magnitude
   - ◯ A starting point
   - ◯ None of these

2. Is the value $[\ 5.2 \quad 6.3 \quad \pi \quad 4.9\ ]$ a vector or a scalar?

   A vector.

3. What is the result of the following operations? (Note: if any of the operations are impossible/undefined, simply write "*u cant do dat*" instead of giving a mathematical answer.)

   (a) $[\ 4 \quad -1 \quad 1\ ] + [\ 0 \quad 2 \quad 3\ ]$

   $[\ 4 \quad 1 \quad 4\ ]$

   (b) $[\ 2 \quad 2\ ] \cdot [\ 9 \quad 1 \quad 6\ ]$

   u cant do dat

   (c) $8 \cdot [\ 2 \quad 2\ ]$

   $[\ 16 \quad 16\ ]$

   (d) $[\ 3 \quad 3\ ] + 6$

   u cant do dat

   (e) $[\ 3 \quad 1\ ] - [\ 1 \quad 3\ ]$

   $[\ 2 \quad -2\ ]$

   (f) $[\ 36 \quad 0 \quad 0 \quad 0 \quad 5 \quad 91\ ] \cdot [\ 0 \quad 15 \quad 41 \quad 2 \quad 1 \quad 0\ ]$

   $36 \cdot 0 + 0 \cdot 15 + 0 \cdot 41 + 0 \cdot 2 + 5 \cdot 1 + 91 \cdot 0 = 5$

4. What special word can be used to describe these two vectors? (Hint: it has ten letters and starts with an **o**.) $\begin{bmatrix} 4 & 2 \end{bmatrix}$ and $\begin{bmatrix} 1 & -2 \end{bmatrix}$

   Orthogonal.

5. What's the Euclidean (ℓ^2) norm of the vector $\begin{bmatrix} 1 & 1 & 1 & 1 \end{bmatrix}$?

   $\sqrt{1^2 + 1^2 + 1^2 + 1^2} = \sqrt{4} = 2.$

6. What's the Manhattan/taxicab (ℓ^1) norm of the vector $\begin{bmatrix} 1 & 1 & 1 & 1 \end{bmatrix}$?

   $1 + 1 + 1 + 1 = 4.$

7. Normalize this vector (using the Euclidean, or ℓ^2, norm): $\begin{bmatrix} 1 & 1 & 1 & 1 \end{bmatrix}$.

   $\frac{\begin{bmatrix} 1 & 1 & 1 & 1 \end{bmatrix}}{2} = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \end{bmatrix}$.

   Now double-check: is it normalized?

   $\sqrt{(\frac{1}{2})^2 + (\frac{1}{2})^2 + (\frac{1}{2})^2 + (\frac{1}{2})^2} = \sqrt{\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}} = \sqrt{1} = 1.$ ✓