DSC 140B - Quiz 01

Name: [   ]   PID: [   ]

About the quizzes:

- Quizzes in DSC 140B are *optional* and graded pass/fail.

- A score of 70% or higher earns a "pass" and 1.5 credits toward your final grade.

- If you don't pass, no credits are earned, but it doesn't hurt your grade.

- You have 30 minutes to complete the quiz.

- At least one of the questions below will be on an exam (probably with slight changes, such as different numbers).

- Unfortunately, we can't answer clarifying questions during the quiz. If you think a question has a bug or is unclear, please let us known in a private post on Campuswire after the quiz, and we'll take it into account when grading.

Problem 1.

True or False: $\sum_{i=1}^{n} 6(x_i + 10) = (6\sum_{i=1}^{n} x_i) + 60n$.

○ True

○ False

Problem 2.

How should we interpret $\displaystyle\sum_{i=1}^{n} x_i + y_i$?

○ $\sum_{i=1}^{n}(x_i + y_i)$

○ $(\sum_{i=1}^{n} x_i) + y_i$

Problem 3.

Compute $(1, 4, 3)^T + (2, 0, 1)^T$.

[   ]

Problem 4.

Compute $4(1, 4, 3)^T$.

[   ]

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Problem 5.

Compute $(1, 4, 3)^T \cdot (2, 0, 1)^T$. Here, $\cdot$ denotes the dot product.

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Problem 6.

Two vectors $\vec{u}$ and $\vec{v}$ are orthogonal to one another (the angle between them is $90°$). What is $\vec{u} \cdot \vec{v}$?

[ ]

Problem 7.

$\vec{u} = (1, 2, 3)^T$. What is the length of $\vec{u}$? (You can leave your answer unsimplified.)

[ ]

Problem 8.

Suppose $\vec{v} = (3, 3)^T$.

a) Find a unit vector $\vec{u}^{(1)}$ such that $\vec{u}^{(1)} \cdot \vec{v} = 0$. (You can leave your answer unsimplified.)

[ ]

b) Find a unit vector $\vec{u}^{(2)}$ such that $|\vec{u}^{(2)} \cdot \vec{v}|$ is maximized. (You can leave your answer unsimplified.)

[ ]

Problem 9.

Which of these is another expression for the norm of $\vec{u}$ (that is, $\|\vec{u}\|$)?

○ $\vec{u} \cdot \vec{u}$

○ $\sqrt{\vec{u}^2}$

○ $\sqrt{\vec{u} \cdot \vec{u}}$

○ $\vec{u}^2$

Problem 10.

Let $\vec{u}, \vec{v}, \vec{w}$ be vectors, and let α, β be scalars.

True or False: $\vec{u} \cdot (\alpha\vec{v} + \beta\vec{w}) = \alpha\vec{u} \cdot \vec{v} + \beta\vec{u} \cdot \vec{w}$.

○ True

○ False

Problem 11.

Let A, B, C, X be matrices of appropriate dimensions. True or False: $X(AB + C)^T = XB^T A^T + XC^T$.

○ True

○ False

Problem 12.

Let

$$A = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 & 10 \\ 11 & 12 & 13 & 14 & 15 \end{pmatrix},$$

and let $\vec{x} = (0, 1, 0, 2, 0)^T$.

What is $A\vec{x}$?

Problem 13.

Let A, B and C be matrices of appropriate dimensions.

True or False: $ABC = CBA$.

○ True

○ False

Problem 14.

Let $\vec{x} \in \mathbb{R}^d$ and let A be a $d \times d$ matrix. What type of object is $\vec{x}^T A\vec{x}$?

○ A scalar

○ A vector in $\mathbb{R}^d$

○ A vector in $\mathbb{R}^n$

○ A matrix in $\mathbb{R}^{d \times d}$

○ A matrix in $\mathbb{R}^{n \times n}$

○ A matrix in $\mathbb{R}^{n \times d}$

Problem 15.

Let $\vec{x}^{(1)}, \ldots, \vec{x}^{(n)}$ be d-dimensional vectors. What type of object is:

$$\frac{1}{n} \sum_{i=1}^{n} \vec{x}^{(i)} (\vec{x}^{(i)})^T$$

○   A scalar

○   A vector in $\mathbb{R}^d$

○   A vector in $\mathbb{R}^n$

○   A matrix in $\mathbb{R}^{d \times d}$

○   A matrix in $\mathbb{R}^{n \times n}$

○   A matrix in $\mathbb{R}^{n \times d}$