Staple!

Ord: ___ ___

Linear Algebra
MAS4105 *14G8*

Class-W

Prof. JLF King
Tuesday, 05Apr2022

Note. The geometry on $\mathbb{R}^n$ is defined by the dot-product.

Write **DNE** if the object does not exist or the operation cannot be performed. NB: **DNE** $\neq \{\} \neq 0$.

W1: Show no work.

___ ___ **a** For a LOR (letter-of-recommendation), Prof. K requires two courses, or a Special Topics or graduate course Circle:

Yes **True** **Darn tootin'!**

___ ___ **b** In $\mathbb{R}^3$, the closest point to $\mathbf{v} := (1, -7, -5)$ on the line through $\mathbf{0}$ and $\mathbf{q} := (1, 2, 3)$, is (____ , ____ , ____).

In $\mathbb{R}^2$, with $\mathbf{s} := (1, 8)$ and $\mathbf{w} := (4, -2)$, compute $\text{Orth}_{\mathbf{w}}(\mathbf{s})=$ ________ .

___ ___ **c** Put inner-product $\langle f, g\rangle := \int_0^2 [f \cdot g]$. the VS of polynomials. With $\mathbf{D} := 1 + x$ and $\mathbf{u} := x^2$, compute $\text{Proj}_{\mathbf{D}}(\mathbf{u})=$ ________ .

___ ___ **d** Let R_θ be the std. rotation [by θ] matrix. With

$$\mathsf{C} := \begin{bmatrix} \sqrt{3} & -1 \\ 1 & \sqrt{3} \end{bmatrix} \quad \text{and} \quad \mathsf{B} := \begin{bmatrix} \sqrt{2} & -\sqrt{2} \\ \sqrt{2} & \sqrt{2} \end{bmatrix},$$

the product $[\mathsf{CB}]^{35} = \alpha \cdot \mathsf{R}_\theta$, with $\alpha=$ ________ $\in \mathbb{R}_+$ and $\theta=$ ________ $\in (-180°, 180°]$.

___ ___ **e** $\mu=$ ________ $\leq \nu =$ ________

are the eigenvals of $\mathsf{G} := \begin{bmatrix} 11 & 30 \\ -6 & -16 \end{bmatrix}$. Let $\mathsf{D} := \begin{bmatrix} \mu & 0 \\ 0 & \nu \end{bmatrix}$. Then $\mathsf{D} = \mathsf{U}^{-1}\mathsf{G}\mathsf{U}$ where the 2×2 *integer* matrix U is

$$\mathsf{U} = \begin{bmatrix} \quad & \quad \\ \quad & \quad \end{bmatrix}.$$

OYOP: Essay: *Write on every* ***second*** *line, so that I can easily write between the lines.*

W2: Matrix $\mathsf{M} = \begin{bmatrix} \mathsf{A} & \mathsf{B} \\ \mathsf{C} & \mathsf{D} \end{bmatrix}$, where A and D are 5×5 and 7×7, resp. Suppose C is the 7×5 **zero-matrix**. Prove that $\text{Det}(\mathsf{M}) = \text{Det}(\mathsf{A}) \cdot \text{Det}(\mathsf{D})$. [*Hint:* A good picture helps.]

Before starting your proof, *state precisely* the formula for determinant that you are using.

End of Class-W

W1:	___ ___ ___	165pts
W2:	___ ___	65pts
Total:	___ ___ ___	230pts

NAME: ________________________________

HONOR CODE: *"I have neither requested nor received help on this exam other than from my professor or TA."*

Signature: ________________________________