Staple!

Ord: ___ ___

Calc 3 MAC2313 | **Class-U** | Prof. JLF King, *Touch*: 4Aug2016

U1: Short answer. Show no work.

Please write **DNE** in a blank <u>if</u> the described object does not exist or if the indicated operation cannot be performed.

___ ___ **a** Let $\mathbf{p} := (4,1,3)$, $\mathbf{q} := (1,7,0)$ and $\mathbf{w} := (1,1,0)$. A dir-vec for $\mathbb{L} := \text{Line}(\mathbf{p},\mathbf{q})$ is $\mathbf{D} := \mathbf{p} - \mathbf{q} =$ ______________ .

The point on $\mathbb{L}$ closest to $\mathbf{w}$ is $\mathbf{C} =$ ______________________ .

___ ___ **b** Let θ denote the angle between the longest-diagonal of a cube, and an edge. Then $\cos(\theta) =$ ________________ .

___ ___ **c** Every 3×3 matrix M has $\text{Det}(5\mathsf{M}) = \alpha \cdot \text{Det}(\mathsf{M})$, where α is circle

5^9 5^3 5^2 5 3^5 9^5 3^{25} None-of-these

___ ___ **d** Let $\mathsf{M}(x) := \begin{bmatrix} x+1 & 2x & 1 \\ -1 & 1 & 1 \\ 0 & x-1 & 0 \end{bmatrix}$. Then

$\text{Det}(\mathsf{M}(x)) =$ ______ $+$ ______ $x +$ ______ $x^2 +$ ______ x^3.

U2: *Here*, let *AT* mean "Always True", *AF* mean "Always False" and *Nei* mean "<u>Nei</u>ther always true nor always false". Below, $\mathbf{v}, \mathbf{w}, \mathbf{x}$ repr. *distinct*, <u>*non-zero*</u> vectors in $\mathbb{R}^4$, a $\mathbb{R}$-VS. Please circle the correct response:

___ ___ **y1** If $\mathbf{x} \notin \text{Span}\{\mathbf{v}, \mathbf{w}\}$ then $\{\mathbf{v}, \mathbf{w}, \mathbf{x}\}$ is linearly independent. *AT AF Nei*

___ ___ **y2** Collection $\{\mathbf{0}, \mathbf{x}\}$ is linearly-indep. *AT AF Nei*

___ ___ **y3** $\text{Span}\{\mathbf{v}, \mathbf{w}, \mathbf{x}, \mathbf{v} + 2\mathbf{w} + 3\mathbf{x}\}$ is all of $\mathbb{R}^4$. *AT AF Nei*

___ ___ **y4** If none of $\mathbf{v}, \mathbf{w}, \mathbf{x}$ is a multiple of the other vectors, then $\{\mathbf{v}, \mathbf{w}, \mathbf{x}\}$ is linearly independent. *AT AF Nei*

___ ___ **y5** For 2×2 matrices: $\text{Det}(\mathsf{B} + \mathsf{A}) = \text{Det}(\mathsf{B}) + \text{Det}(\mathsf{A})$. *AT AF Nei*

U3: Use $\langle \cdot, \cdot \rangle$ for an inner-product on $\mathbb{R}^N$. <u>State</u> the Cauchy-Schwarz Inequality Thm, carefully stating the IFF-condition for equality.

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U4: Triangle Inequality Thm: *For all* $\mathbf{u}, \mathbf{w} \in \mathbf{V}$, *we have that* $\|\mathbf{u} + \mathbf{w}\| \leqslant \|\mathbf{u}\| + \|\mathbf{w}\|$. (Omitted: The IFF-condition for equality.)

<u>**Derive**</u> the Triangle-Inequality Thm, using the C-S thm.

End of Class-U

U1:	___ ___	95pts
U2:	___ ___	90pts
U3:	___ ___	30pts
U4:	___ ___	45pts
Total:	___ ___ ___	260pts

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

Name/Signature/Ord

Ord:

____ ___ ___