Math 194
Test 4 (5.2-6.3) 1062

Name____

This in-class exam is worth 90 points. SHOW ALL WORK ON THE EXAM INORDER TO RECEIVE CREDIT. For problems that require solving systems of linear equations, you must use augmented matrices and put them in reduced row echelon form. You must use the techniques that were discussed in class in order to receive full credit. All determinants must be evaluated using cofactor expansion. No credit for guessing. NO CALCULATORS OR CELL PHONES. NO NOTES. You are on the DVC honor code. You may not work with classmates. Cameras must be on for the duration of the exam in order to receive credit

1. Given the function below

$< \boldsymbol{u}, \boldsymbol{v} >= u_1v_1 - 2u_2v_2 + u_3v_3$, where $u = (u_1, u_2, u_3)$ & $v = (v_1, v_2, v_3)$

This operation does not define an *inner product* on R^3

a) Prove Axiom 2 holds in the definition of Inner Product Space for all vectors in R^3

note: Axiom 2: $< u, v + w >=< u, v > + < u, w >$

1A) let $\vec{w} = (w_1, w_2, w_3)$

$$\begin{aligned}
< \vec{u}, \vec{v} + \vec{w} > &= < (u_1, u_2, u_3), (v_1, v_2, v_3) + (w_1, w_2, w_3) > \\
&= < (u_1, u_2, u_3), (v_1 + w_1, v_2 + w_2, v_3 + w_3) > \\
&= u_1(v_1 + w_1) - 2u_2(v_2 + w_2) + u_3(v_3 + w_3) \\
&= u_1v_1 + u_1w_1 - 2u_2v_2 - 2u_2w_2 + u_3v_3 + u_3w_3 \\
&= u_1v_1 - 2u_2v_2 + u_3v_3 + u_1w_1 - 2u_2w_2 + u_3w_3 \\
&= < \vec{u}, \vec{v} > + < \vec{u}, \vec{w} >
\end{aligned}$$

b) Show by *counterexample* that *Axiom* 4 does not hold

Note: Axiom 4: $< u, u > \geq 0$ and $< u, u >= 0$ iff $\boldsymbol{u} = \boldsymbol{0}$

B) let $\vec{v} = (1, 4, 1)$

$< \vec{v}, \vec{v} > = 1^2 - 2 \cdot 4^2 + 1^2 < 0 \therefore < \vec{v}, \vec{v} > \geq 0$ fails