Name: ____

Problem	Points	Score
1	25	
2a	25	
2b	25	
3	25	
Total	100	

Notes: The exam is closed book and closed notes.

(25 pts) Problem No. 1:

Show that: $det\begin{bmatrix} 0 & I_n \\ I_m & 0 \end{bmatrix} = (-1)^{nm}$.

Problem No. 2:

(25 pts) (a) Find the eigenvalues for $A = \begin{bmatrix} 3 & -2 \\ 4 & -1 \end{bmatrix}$. Explain why this answer makes sense.

(25 pts) (b) Find the eigenvalues and eigenvectors for $A = \begin{bmatrix} 2 & 1 \\ -1 & 4 \end{bmatrix}$. Explain if this answer makes sense.

(25 pts) Problem No. 3:

A square with sides if length 1 in a 2D space has an area of $1x1 = 1$. A (unit) cube with sides of length 1 in a 3D space has a volume of $1x1x1 = 1$. It can be argued that the analog of a unit cube in 4D space would be an object formed by vertices (1,0,0,0), (0,1,0,0), (0,0,1,0) and (0,0,0,1) and would enclose a 'volume' of $1x1x1x1 = 1$ (or more generally r^n where r is the length of a side). We refer to this shape as a hypercube (a cube in n-dimensions).

How might you prove this using concepts developed in this section of the course? What happens if the sides are no longer perpendicular (a 4D parallelopiped)?