Name:

|  |  |  |
| --- | --- | --- |
| Problem | Points | Score |
| 1 | 50 |  |
| 2 | 30 |  |
| 3 | 20 |  |
| Total | 100 |  |

Notes: The exam is closed book and closed notes.

**(50 pts) Problem No. 1**:

A square box is defined by the vertices: [1,0], [2,0], [2,1], [1,1]. Find a transformation, $T(x)$, that transforms this box so that its vertices lie at: [0,0], [-1,0], [-1, -1], [0, -1]. Consider x as a 2x1 vector that represents each vertex. The transformation should map x to the corresponding point in the new object, y. Use the attached picture as a visualization of what your transformation should. Hint: Your transformation should include at least one matrix and one vector.



Note: You must derive the transformation using linear algebra – you cannot simply deduce it using divine inspiration ;) You will be graded on the thoroughness of your derivation.

**(30 pts) Problem No. 2**:

Solve for the matrix Y given the equation: $Y = AB + C^{T}D^{-1}$, where:

$A=\left[\begin{matrix}1&0\\0&1\end{matrix}\right]$,$B=\left[\begin{matrix}1&1\\1&1\end{matrix}\right]$,$C=\left[\begin{matrix}1&1\\0&1\end{matrix}\right]$,$D=\left[\begin{matrix}1&1\\0&2\end{matrix}\right]$

**(20 pts) Problem No. 3**:

Determine whether the matrix $A=\left[\begin{matrix}1&1&1\\0&1&0\\1&0&1\end{matrix}\right]$ is singular using only concepts covered in Chapters 1-2, Show your work and justify your answer.