W subspace In
$$\mathbb{R}^n$$

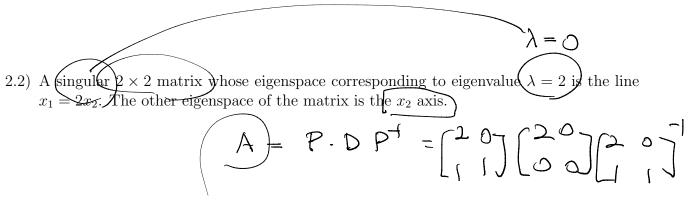
 $\dim(W) + \dim(W^{\perp}) = n$

Midterm 3 Lecture Review Activity, Math 1554

1. Indicate **true** if the statement is true, otherwise, indicate **false**.

	true	false
a) If S is a two-dimensional subspace of \mathbb{R}^{50} , then the dimension of S^{\perp} is 48.	×	0
b) An eigenspace is a subspace spanned by a single eigenvector. Cyprocedure Control of the n × n zero matrix can be diagonalized.	O Sectoria	1 m to a
c) The $n \times n$ zero matrix can be diagonalized.	△ A	
d) A least-squares line that best fits the data points $(0, y_1), (1, y_2), (2, y_3)$ is unique for any values y_1, y_2, y_3 .	×	etjenialie

- 2. If possible, give an example of the following.
 - 2.1) A matrix, A, that is in echelon form, and dim $((\operatorname{Row} A)^{\perp}) = 2$, dim $((\operatorname{Col} A)^{\perp}) = 1$



- 2.3) A subspace S, of \mathbb{R}^4 , that satisfies $\dim(S) = \dim(S^{\perp}) = 3$.
- 2.4) A 2×3 matrix, A, that is in RREF. $(\operatorname{Row} A)^{\perp}$ is spanned by $\begin{pmatrix} 2 \\ 3 \\ 1 \end{pmatrix}$.

$$\begin{cases} (o, y_1) & (1, y_2) \\ y = \beta_0 + \beta_1 \times \\ y_1 = \beta_0 + \beta_1 \cdot 0 \\ y_2 = \beta_0 + \beta_1 \cdot 2 \\ y_3 = \beta_0 + \beta_1 \cdot 2 \\ y_4 = \beta_0 + \beta_1 \cdot 2 \\ y_5 = \beta_0 + \beta_1 \cdot 0 \\ \beta_0 = \beta_0 + \beta_1 \cdot 0 \\$$

- 3. Circle **possible** if the set of conditions are create a situation that is possible, otherwise, circle **impossible**. For the situations that are possible give an example.
 - 3.1) A is $n \times n$, $A\vec{x} = A\vec{y}$ for a particular $\vec{x} \neq \vec{y}$, \vec{x} and \vec{y} are in \mathbb{R}^n , and dim((Row A) $^{\perp}$) $\neq 0$.

possible impossible

3.2) A is $n \times n$, $\lambda \in \mathbb{R}$ is an eigenvalue of A, and $\dim((\operatorname{Col}(A - \lambda I))^{\perp}) = 0$.

possible

impossible

3.3) $\operatorname{proj}_{\vec{v}}\vec{u} = \operatorname{proj}_{\vec{u}}\vec{v}, \ \vec{v} \neq \vec{u}, \ \text{and} \ \vec{u} \neq \vec{0}, \ \vec{v} \neq \vec{0}.$

possible

impossible

4. Consider the matrix A.

$$A = \begin{pmatrix} 1 & -3 & 0 & 2 \\ 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

Construct a basis for the following subspaces and state the dimension of each space.

- $4.1) (\operatorname{Row} A)^{\perp}$
- 4.2) Col A
- $4.3) (\operatorname{Col} A)^{\perp}$