# Practice Problems

**Question 1.**
How many solutions does $x^6 = 4 + 2i$ have

a) 6 b) 0 c) 1 d) 5

**Question 2.**
Which of the following is a cubed root of the complex number $-1 - i$.

a) $2^{\frac{1}{6}} e^{i \arctan(1)}$ b) $\sqrt{2} e^{i(\arctan(1)-\pi)}$ c) $\sqrt{2} e^{i(\arctan(1)-\pi)/3}$ d) $2^{\frac{1}{6}} e^{i(\arctan(1)-\pi+2\pi)/3}$

**Question 3.**
If $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -4 \\ 2 & 5 \end{bmatrix}$, what is the product $AB$?

a) $AB = \begin{bmatrix} 2 & -5 \\ 1 & 6 \end{bmatrix}$ b) $AB = \begin{bmatrix} -1 & -9 \\ 1 & 9 \end{bmatrix}$

c) $AB = \begin{bmatrix} 0 & -3 \\ 3 & 4 \end{bmatrix}$ d) $AB = \begin{bmatrix} 5 & -5 \\ -3 & 3 \end{bmatrix}$

**Question 4.**
If $A = \begin{bmatrix} 2 & 0 & -3 \\ 0 & 1 & 4 \end{bmatrix}$ and $\vec{v} = \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}$, what is $A\vec{v}$?

a) $A\vec{v} = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$ b) $A\vec{v} = \begin{bmatrix} -4 \\ 10 \end{bmatrix}$ c) $A\vec{v} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$ d) $A\vec{v} = \begin{bmatrix} -1 \\ 5 \end{bmatrix}$

**Question 5.**
If $A \in \mathbb{R}^{m \times n}$ then what is the dimension of $A^T A$

a) $m \times m$ b) Does not exist c) $n \times n$ d) $m \times n$

**Question 6.**
Which of the following matrices is in echelon form?

a) $\begin{bmatrix} 1 & 1 & 1 & 2 \\ 0 & 1 & 3 & 3 \\ 0 & 0 & 0 & -2 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 1 & 0 & -10 & -9 \\ 0 & 0 & 1 & -7 & -7 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{bmatrix}$ d) All of the above

**Question 7.**

Consider a linear system $A\vec{x} = \vec{b}$ with 4 unknown variables $\vec{x} = [x_1, x_2, x_3, x_4]^T$. The augmented matrix $M = [A|\vec{b}]$ has the reduced matrix $\begin{bmatrix} 0 & 2 & 1 & 1 & 1 \\ 0 & 0 & 0 & 2 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$, what are the pivot variables (basic variables)?

a) $x_1, x_3$ b) $x_2, x_4$ c) 2,1 d) $2, 2$

**Question 8.**

Consider a linear system $A\vec{x} = \vec{b}$ with 4 unknown variables $\vec{x} = [x_1, x_2, x_3, x_4]^T$. The augmented matrix $M = [A|\vec{b}]$ has the reduced matrix $\begin{bmatrix} 0 & 2 & 1 & 1 & 1 \\ 0 & 0 & 0 & 2 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$, what are the free variables?

a) $x_1, x_3$ b) $x_2, x_4$ c) 0,1 d) $1, 1$

**Question 9.**

Which of the following matrices is in row canonical form?

a) $\begin{bmatrix} 1 & 1 & 1 & 2 \\ 0 & 1 & 3 & 3 \\ 0 & 0 & 0 & -2 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 1 & 0 & -10 & -9 \\ 0 & 0 & 1 & -7 & -7 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 2 & 0 & 0 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{bmatrix}$

d) $\begin{bmatrix} 1 & 2 & 0 & 1 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

**Question 10.**

What is the inverse of $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$?

a) $A^{-1} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1/2 & 0 \\ 0 & 0 & .25 \end{bmatrix}$

b) $A^{-1} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

c) $A^{-1} = \begin{bmatrix} 1 & 1/2 & 1/4 \\ 0 & -1/2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

d) $A^{-1} = \begin{bmatrix} 1 & 1 & -4 \\ 0 & -1/2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

**Question 11.**

What is the inverse of $A = \begin{bmatrix} -3 & 2 \\ 4 & 1 \end{bmatrix}$?

a) $A^{-1} = \begin{bmatrix} -1/3 & 0 \\ 0 & 1 \end{bmatrix}$

b) $A^{-1} = \frac{1}{-11} \begin{bmatrix} 1 & -2 \\ -4 & -3 \end{bmatrix}$

c) $A^{-1} = \frac{1}{5} \begin{bmatrix} 1 & -2 \\ -4 & -3 \end{bmatrix}$

d) $A^{-1} = \frac{1}{5} \begin{bmatrix} 3 & 4 \\ 2 & -1 \end{bmatrix}$

**Question 12.**

What is the row canonical form of $A = \begin{bmatrix} 1 & 0 & 2 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$?

a) Already in row canonical form

b) $\begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$

d) $\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

**Question 13.**

Given $A^{-1} = \begin{bmatrix} -1 & 0 \\ 2 & 4 \end{bmatrix}$ solve $A\vec{x} = \vec{b}$ for $\vec{b} = [1, 2]^T$.

a) $\vec{x} = \begin{bmatrix} -1 \\ 10 \end{bmatrix}$

b) $\vec{x} = \begin{bmatrix} -2 \\ 8 \end{bmatrix}$

c) no solution

d) infinite solutions

**Question 14.**

How many solutions does $A\vec{x} = \vec{b}$ have? The augmented matrix is $[A|b] = \begin{bmatrix} 0 & 0 & 2 & -3 \\ 0 & 1 & 5 & 10 \\ 0 & 0 & 0 & 3 \end{bmatrix}$.

a) no solution

b) infinite solution

c) insufficient information

d) one solution

**Question 15.**

Given $[A|b] = \begin{bmatrix} 1 & 0 & 2 & -3 \\ 0 & 0 & 5 & 10 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ how many solutions does $A\vec{x} = \vec{b}$ have?

a) no solution

b) infinite solution

c) insufficient information

d) one solution

**Question 16.**

Given $[A|b] = \begin{bmatrix} 1 & 0 & 2 & -3 \\ 0 & 1 & 5 & 10 \\ 0 & 0 & 1 & 0 \end{bmatrix}$ how many solutions does $A\vec{x} = \vec{b}$ have?

a) no solution

b) infinite solution

c) insufficient information

d) one solution

**Question 17.**
Which of the following sets of vectors are independent?

a) $\left\{ \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \right\}$

b) $\left\{ \begin{bmatrix} 1 \\ -1 \end{bmatrix}, \begin{bmatrix} 0 \\ 4 \end{bmatrix}, \begin{bmatrix} -2 \\ 3 \end{bmatrix} \right\}$

c) $\left\{ \begin{bmatrix} 1 \\ 2 \end{bmatrix}, 5 \begin{bmatrix} 1 \\ 2 \end{bmatrix} \right\}$

d) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \right\}$

**Question 18.**
Vector $\vec{v} = [-5, 2]^T$ is a linear combination of which set of vectors?

a) $\left\{ \begin{bmatrix} -5 \\ 0 \end{bmatrix}, \begin{bmatrix} -2 \\ 0 \end{bmatrix} \right\}$

b) $\left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -8 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \end{bmatrix} \right\}$

c) $\left\{ \begin{bmatrix} -1 \\ 1 \end{bmatrix} \right\}$

d) None of the above

**Question 19.**
Vector $\vec{v} = [-1, 1]^T$ is a **unique** linear combination of which set of vectors?

a) $\left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \end{bmatrix} \right\}$

b) $\left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix} \right\}$

c) $\left\{ \begin{bmatrix} -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ -2 \end{bmatrix} \right\}$

d) None of the above

**Question 20.**
Vector $\vec{v} = [-3, 1]^T$ is in the span of what set?

a) $\left\{ \begin{bmatrix} 1 \\ 5 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \end{bmatrix} \right\}$

b) $\left\{ \begin{bmatrix} 6 \\ -2 \end{bmatrix} \right\}$

c) $\left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\}$

d) All of the above

**Question 21.**
Which matrix below has $colsp(A) \in \mathbb{R}^3$?

a) $\begin{bmatrix} 1 & 0 & 2 & -3 \\ 0 & 1 & 5 & 10 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 0 & 2 & -3 \\ 0 & 1 & 5 & 10 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 5 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

**Question 22.**
Which matrix below has $colsp(A) = \mathbb{R}^3$?

a) $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 5 \\ 0 & 0 & 0 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 2 & 5 & -3 \\ 0 & 1 & 0 & 10 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

d) None of the above

**Question 23.**
What is the rank of matrix $A = \begin{bmatrix} 1 & 0 & 2 & 2 & -4 & -10 \\ 0 & 1 & 5 & 0 & 3 & -1 \\ 0 & 0 & 4 & 4 & -3 & 1 \end{bmatrix}$?

a) 1

b) 2

c) 3

d) 6

**Question 24.**
Which of the following sets is a basis for $rowsp(A)$, where $A = \begin{bmatrix} 1 & 0 & -2 \\ 3 & 4 & 0 \\ -5 & 0 & 1 \end{bmatrix}$, which is row equivalent to $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$?

a) $\left\{ \begin{bmatrix} 1 \\ 3 \\ -8 \end{bmatrix}^T, \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}^T, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}^T \right\}$

b) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}^T, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}^T, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}^T \right\}$

c) $\left\{ \begin{bmatrix} 1 \\ 3 \\ -5 \end{bmatrix}^T, \begin{bmatrix} 0 \\ 4 \\ 0 \end{bmatrix}^T, \begin{bmatrix} -2 \\ 0 \\ 1 \end{bmatrix}^T \right\}$

d) All of the above

**Question 25.**
Which of the following sets is a basis for $colsp(A)$, where $A = \begin{bmatrix} 1 & 0 & 2 & 2 \\ 0 & 1 & 5 & 0 \end{bmatrix}$?

a) $\left\{ \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \end{bmatrix} \right\}$

b) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 2 \\ 2 \end{bmatrix}^T, \begin{bmatrix} 0 \\ 1 \\ 5 \\ 0 \end{bmatrix}^T \right\}$

c) $\left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \end{bmatrix} \right\}$

d) None of the above

**Question 26.**

What is $\dim(rowsp(A))$, where $A = \begin{bmatrix} 1 & 0 & 2 & 2 \\ 0 & 0 & 0 & 3 \\ 0 & 2 & 5 & 0 \\ 0 & 0 & 0 & 5 \end{bmatrix}$?

a) 1 b) 2

c) 3 d) 4

**Question 27.**

What is $\dim(colsp(A))$, where $A = \begin{bmatrix} 1 & 0 & 2 & 2 \\ 0 & 0 & 0 & 3 \\ 0 & 2 & 5 & 0 \\ 0 & 0 & 0 & 5 \end{bmatrix}$?

a) 1 b) 2

c) 3 d) 4

**Question 28.**

What is the $\dim(Ker(A))$ if $A = \begin{bmatrix} 1 & 0 & 0 & 0 & 3 \\ 8 & 1 & 0 & 1 & 3 \\ 3 & 0 & 2 & 0 & -1 \end{bmatrix}$?

a) 0 b) 1 c) 2 d) 3 e) 4

**Question 29.**

Which of the following vectors is in the null space of $A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$?

a) $\begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}$ b) $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ c) $\begin{bmatrix} -2 \\ 0 \\ -1 \end{bmatrix}$ d) $\begin{bmatrix} -2 \\ 1 \\ -1 \end{bmatrix}$

**Question 30.**

Which of the following matrices has $\det(A) = -6$?

a) $A = \begin{bmatrix} 3 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 4 & -1 & -1 & 0 \\ -2 & 0 & 0 & 2 \end{bmatrix}$ b) $A = \begin{bmatrix} 2 & 4 \\ 1 & 1 \end{bmatrix}$

c) $A = \begin{bmatrix} 1 & -6 \\ 1 & 1 \end{bmatrix}$ d) $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -6 \\ 0 & 1 & 1 \end{bmatrix}$

**Question 31.**
Which of the following matrices has $\det(A) = 0$?

a) $A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 \end{bmatrix}$

b) $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

c) $A = \begin{bmatrix} 0 & 2 & 0 \\ -10 & 8 & 5 \\ -2 & 6 & 1 \end{bmatrix}$

d) All of the above

**Question 32.**
Compute the determinant of $A = \begin{bmatrix} 1 & 2 & 1 \\ 1 & 4 & 5 \\ 2 & 4 & 7 \end{bmatrix}$?

a) 10

b) 28

c) 0

d) 1

e) None of the above

**Question 33.**
Let $A$ and $B$ be $4 \times 4$ matrices with $\det(A) = -3$ and $\det(B) = -2$, compute $\det(BA^T)$.

a) 6

b) -6

c) 3/2

d) -2/3

e) Need more information

**Question 34.**
Which of the following matrices has eigenvalues $\lambda_1 = 1, \lambda_2 = 6, \lambda_3 = -2$?

a) $A = \begin{bmatrix} -2 & -1 & 4 \\ 0 & 1 & 10 \\ 0 & 0 & 6 \end{bmatrix}$

b) $A = \begin{bmatrix} -2 & 0 \\ 1 & 6 \end{bmatrix}$

c) $A = \begin{bmatrix} 0 & 6 & 0 \\ 0 & 8 & 0 \\ -2 & 6 & 1 \end{bmatrix}$

d) $A = \begin{bmatrix} 0 & 0 & 1 \\ 2 & 6 & 5 \\ 1 & 3 & -8 \end{bmatrix}$

**Question 35.**
Which of the following matrices has at least one eigenvalue $\lambda = 0$?

a) $A = \begin{bmatrix} -2 & -1 & 4 \\ 0 & 0 & 10 \\ 0 & 1 & 6 \end{bmatrix}$

b) $A = \begin{bmatrix} -2 & 0 \\ 0 & 6 \end{bmatrix}$

c) $A = \begin{bmatrix} 0 & 0 & 8 \\ 1 & 1 & 0 \\ -2 & 6 & 1 \end{bmatrix}$

d) $A = \begin{bmatrix} 0 & 0 & 1 \\ 2 & 6 & 5 \\ 1 & 3 & -8 \end{bmatrix}$

**Question 36.**
A matrix $A \in \mathbb{R}^{3\times 3}$ has eigenvalues $\lambda_1 = 2, \lambda_2 = -1, \lambda_3 = 3$. Which of the following statements must be true?

a) Matrix $A$ has 3 linearly independent eigenvectors

b) Matrix $A$ is full rank

c) The reduced row canonical form of $A$ has three pivot points

d) All of the above

**Question 37.**
Which of the following vectors (if any) are eigenvectors of $\begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$? Let $u = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$, $v = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

a) both

b) $u$

c) $v$

d) neither

e) Not enough information

**Question 38.**
How many distinct eigenvalues can a $3 \times 3$ matrix have?

a) 1

b) 2

c) 3

d) 4

e) $\infty$

**Question 39.**
Which of the following vectors are an orthogonal to $v = \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}$?

a) $\begin{bmatrix} -2 \\ 0 \\ -2 \end{bmatrix}$

b) $\begin{bmatrix} -1 \\ 2 \\ 0 \end{bmatrix}$

c) $\begin{bmatrix} 0 \\ 1 \\ 1/2 \end{bmatrix}$

d) All of the above

**Question 40.**

Which of the following sets of vectors are an orthogonal basis for $\mathbb{R}^3$?

a) $\left\{ \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ -4 \end{bmatrix}, \begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix} \right\}$

b) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \right\}$

c) $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \right\}$

d) All of the above

**Question 41.**

Which of the following matrices are invertible?

a) $A = \begin{bmatrix} 2 & -1 & 4 \\ 0 & 1 & 10 \\ 0 & 0 & 6 \end{bmatrix}$

b) $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

c) $A = \begin{bmatrix} 0 & 6 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

d) All of the above

**Question 42.**

A matrix $A \in \mathbb{R}^{3\times 3}$ is invertible. Which of the following statements must be true?

a) $Ax = b$ has a unique solution

b) Matrix $A$ has det $\neq 0$

c) The reduced row canonical form of $A$ has three pivot points

d) All of the above

**Question 43.**

If $u = \begin{bmatrix} 0 \\ 1 \\ -2 \end{bmatrix}, v = \begin{bmatrix} 3 \\ 0 \\ 1 \end{bmatrix}$ then $u \cdot v =$

a) 2

b) -2

c) 0

d) 1

**Question 44.**

If $u = \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix}, v = \begin{bmatrix} 2 \\ 1 \\ 5 \end{bmatrix}$ then what is dist$(u, v)$

a) $\sqrt{40}$

b) $\sqrt{-32}$

c) $\sqrt{8}$

d) $\sqrt{-4}$

**Question 45.**

If $u = \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}$ then $||u|| =$

a) 4

b) $\sqrt{5}$

c) 3

d) 1

**Question 46.**

If there exists a matrix $P$ such that $D = P^{-1}AP = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, what is the $dim(Ker(A))$?

a) 0

b) 3

c) Not enough information

**Question 47.**

If there exists a matrix $P$ such that $A = PDP^{-1}$ where $D = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ what are the eigenvalues of $A^2$?

a) $\lambda_1 = 1, \lambda_2 = 4, \lambda_3 = -1$

b) $\lambda_1 = 1, \lambda_2 = 4, \lambda_3 = 1$

c) . $\lambda_1 = 1, \lambda_2 = \sqrt{2}, \lambda_3 = i$

d) Not enough information

**Question 48.**

What are the eigenvalues of $A = \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix}$ ?

a) $\lambda_1 = 2, \lambda_2 = 1$

b) $\lambda_1 = 1, \lambda_2 = 4$

c) . $\lambda_1 = 1, \lambda_2 = \sqrt{2}$

d) Not enough information

**Question 49.**

What is a possible transition matrix $P$ that diagonalizes $A = \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix}$ ?

a) $A = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$

b) $A = \begin{bmatrix} .5 & -.5 \\ 0 & 1 \end{bmatrix}$

c) $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

d) $A$ is not diagonalizable

**Question 50.**

If $\lambda = 3.089$ is an eigenvalue of $A = \begin{bmatrix} 2 & 1 & -4 & -1 \\ 0 & 10 & 7 & 2 \\ 5 & -1 & 0 & -1 \\ 3 & 3 & -4 & 2 \end{bmatrix}$ what is the $\det(3.089I - A)$?

a) 0

b) 2

c) 6

d) 7