Practice Final Exam

 $(\ensuremath{\underline{I}})$ This is a preview of the published version of the quiz

Started: Nov 30 at 11:16pm

Quiz Instructions

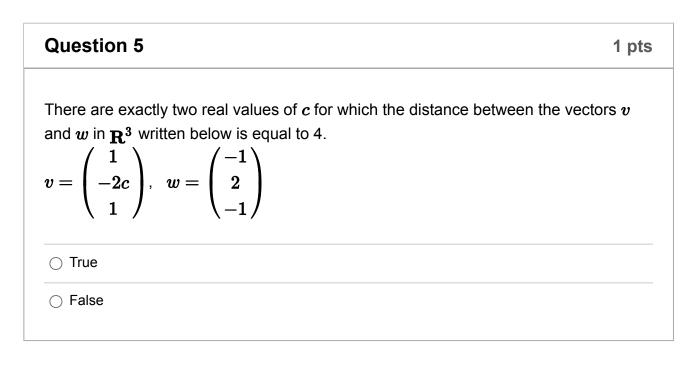
Question 1	1 pts
If $\{v_1,v_2,v_3\}$ is a linearly independent set of vectors in ${f R}^4$ then $\{v_1+v_3,v_2+v_3,v_3\}$	
is linearly independent.	
⊖ True	
⊖ False	

Question 2	1 pts
Suppose A B and C are $n \times n$ matrices	
Suppose A , B , and C are $n \times n$ matrices. If A is invertible and $AB = AC$, then $B = C$.	
⊖ True	
⊖ False	

Question 3	1 pts

If A is a $6 imes 4$ matrix, then the equation $Ax=0$ must have a	a non-trivial solution.
⊖ True	
⊖ False	

Question 4	1 pts
If an $n imes n$ matrix A has two eigenvectors u and v corresponding to the same eigenvalue λ , then u must be a scalar multiple of v .	
⊖ True	
⊖ False	



Question 6	1 pts

Suppose *A* is an $n \times n$ matrix and *v* is an eigenvector of *A* corresponding to the eigenvalue $\lambda = -2$.

Then 2v is an eigenvector of A corresponding to the eigenvalue $\lambda = -4$.

⊖ True

⊖ False

Question 7	1 pts
Suppose W is a subspace of ${f R}^n$ and x is a vector in ${f R}^n$.	
If the orthogonal projection of x onto W is the zero vector, then x is in $W^{\perp}.$	
⊖ True	
⊖ False	

Question 8	1 pts
Suppose A is an invertible $3 imes 3$ matrix. Then the product of the second row o and the third column of A^{-1} must equal 0.	f A
⊖ True	
⊖ False	



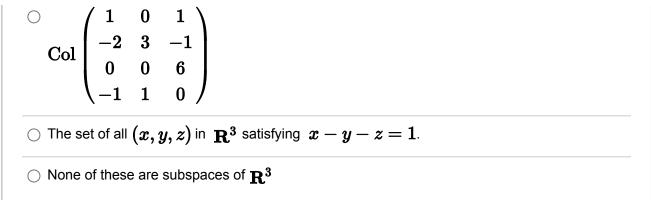
If A is an invertible matrix and λ is an eigenvalue of A , then $rac{1}{\lambda}$ is an eigenvalue of A^{-1}	
⊖ True	

Question 10	1 pts
Let $T: \mathbf{R}^3 ightarrow \mathbf{R}^2$ be the transformation given by $T(x,y,z) = (x-y-z,\ x-y-z).$	
Which of the following is true about T ?	
\bigcirc T is neither one-to-one nor onto. \bigcirc T one-to-one but not onto.	
\bigcirc T is neither one-to-one nor onto.	

1 pts

Which one of the following is a subspace of ${f R}^3$?

C The 1-	eigens	pace	of	1 0 0 3 0 0	$\begin{pmatrix} 1\\ -1\\ 6 \end{pmatrix}$
○ Nul	$\left(egin{array}{c} 1 \\ -2 \\ 0 \end{array} ight)$	0 3 0	$egin{array}{c} 1 \ -1 \ 6 \end{array}$	$egin{array}{c} 1 \\ 2 \\ -7 \end{array}$	



Consider the following matrix A and its reduced row echelon form:

$$A = egin{pmatrix} 1 & -2 & 4 \ 0 & 0 & 1 \ 1 & -2 & 3 \ -2 & 4 & -8 \end{pmatrix} \stackrel{RREF}{\longrightarrow} egin{pmatrix} 1 & -2 & 0 \ 0 & 0 & 1 \ 0 & 0 & 0 \ 0 & 0 & 0 \end{pmatrix}.$$

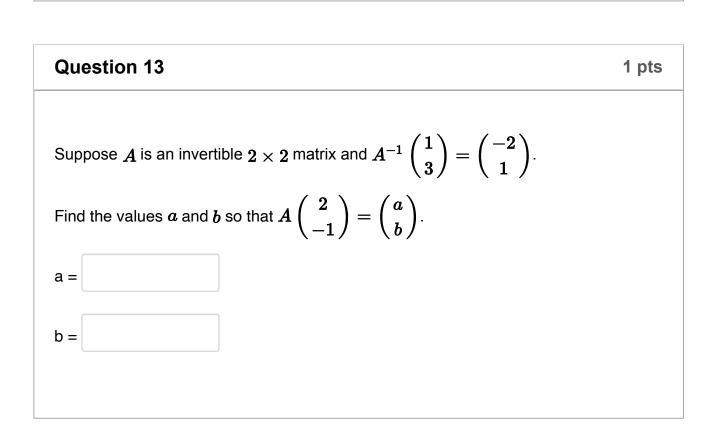
Find a basis for Nul(A).

$$\bigcirc \left\{ \begin{pmatrix} 1 \\ -2 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \right\}$$
$$\bigcirc \left\{ \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \end{pmatrix} \right\}$$
$$\bigcirc \left\{ \begin{pmatrix} 1 \\ 0 \\ 1 \\ 0 \\ 1 \\ -2 \end{pmatrix}, \begin{pmatrix} 4 \\ 1 \\ 3 \\ -8 \end{pmatrix} \right\}$$

1

0

 $\bigcirc \left\{ \begin{pmatrix} 1\\ -2\\ 0 \end{pmatrix} \right\}$

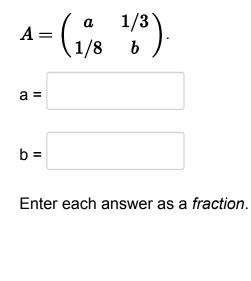


Question 14	1 pts
Let $T: \mathbf{R}^2 \to \mathbf{R}^2$ be the linear transformation satisfying $T\begin{pmatrix} 2\\ 3 \end{pmatrix} = \begin{pmatrix} 1\\ 1 \end{pmatrix}$ and $T\begin{pmatrix} 4\\ 0 \end{pmatrix} = \begin{pmatrix} 2\\ 1 \end{pmatrix}$.	
Which one of the following statements is true?	
\bigcirc <i>T</i> is one-to-one and onto. \bigcirc <i>T</i> is onto but not one-to-one.	
\bigcirc T is one-to-one and onto.	

Question 151 ptsWhich of the following transformations are linear? Select all that apply.
$$\bigcirc T: \mathbf{R}^3 \to \mathbf{R}^3$$
 defined by $T(x, y, z) = (x, y + 1)$. $\bigcirc T: \mathbf{R}^2 \to \mathbf{R}^2$ defined by $T(x, y) = (2x - \sin(y), \pi x)$. $\bigcirc T: \mathbf{R}^2 \to \mathbf{R}^2$ defined by $T(x, y) = (x \ln(2), y)$.



Find the numbers *a* and *b* so that the following matrix is stochastic.



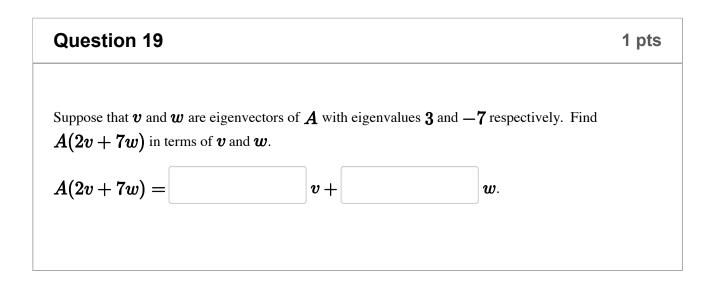
 Question 17
 1 pts

 Fill in the blanks:

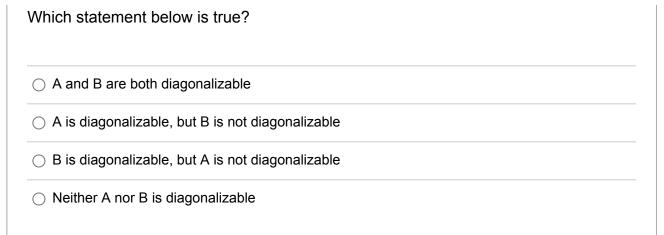
Quiz: Practice Final Exam

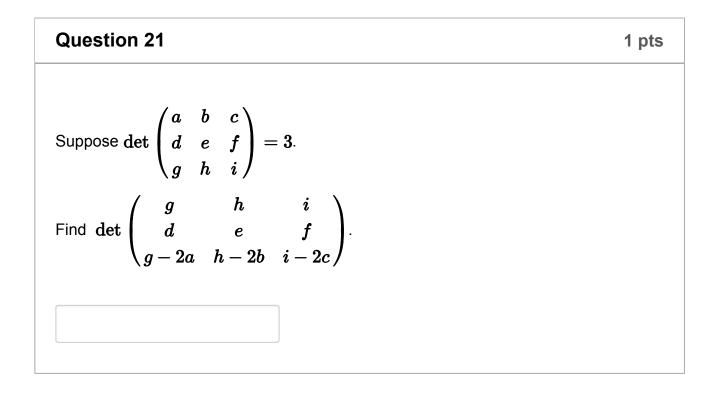
If A is a $3 imes 7$ matrix and B has domain \mathbf{R}^k and codoma		ansformation $T(x)=ABx$
where k =	and p =	

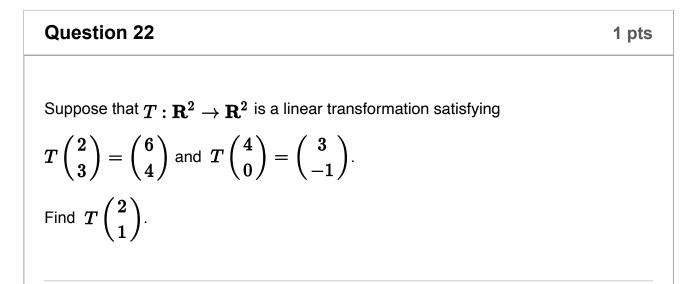
Question 18	1 pts
Suppose A and B are $2 imes 2$ matrices satisfying $\det(A)=-4, \ \det(B)=2.$ Find $\det(A^3B^{-1})$	



Question 20 1 pts
Let
$$A = \begin{pmatrix} 1 & -2 \\ -2 & 1 \end{pmatrix}$$
 and $B = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 2 & 2 \end{pmatrix}$.





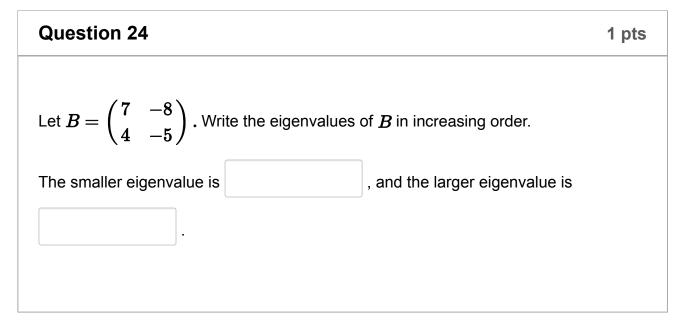


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 \bigcirc



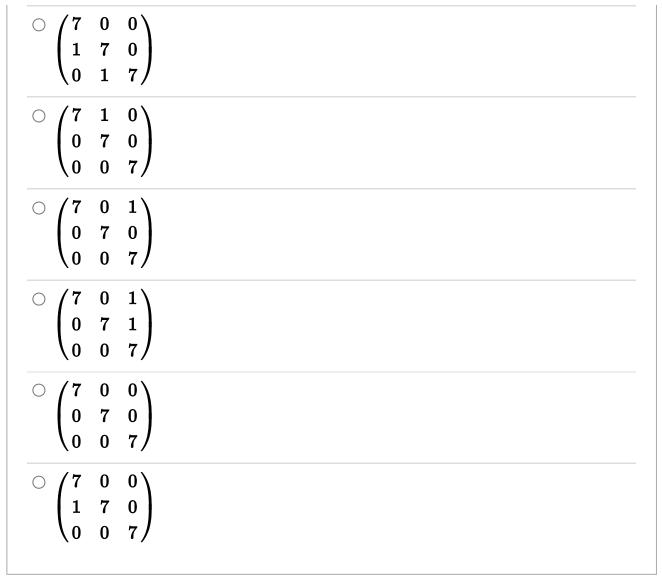
Question 23 1 pts Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be the linear transformation of orthogonal projection onto the line y = -x/4. Write the value of c so that $T\begin{pmatrix} 8\\c \end{pmatrix} = \begin{pmatrix} 8\\c \end{pmatrix}$.



Question 25	1 pts
Let $T: \mathbf{R}^3 \to \mathbf{R}^3$ be the transformation that reflects vectors acro and let A be the standard matrix for T .	ss the <i>yz</i> -plane,
Which one of the following statements is true?	
$\bigcirc \dim(\operatorname{Nul}(A-I)) = 2$ and $\dim(\operatorname{Nul}(A+I)) = 1$	
$\odot \dim(\mathrm{Nul}(A-I)) = 1$ and $\dim(\mathrm{Nul}(A+I)) = 2$	
$\odot \dim(\mathrm{Nul}(A-I)) = 1$ and $\dim(\mathrm{Nul}(A+I)) = 1$	
$\odot \dim(\mathrm{Nul}(A)) = 2$ and $\dim(\mathrm{Nul}(A+I)) = 1$	
$\odot \dim(\mathrm{Nul}(A)) = 1$ and $\dim(\mathrm{Nul}(A+I)) = 2$	

1 pts

Select the matrix below whose 7-eigenspace is a line.

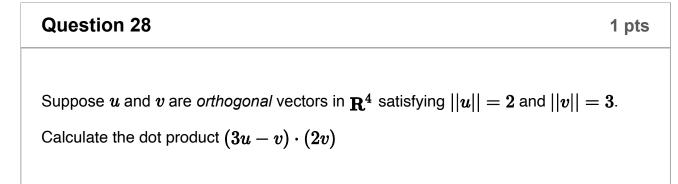


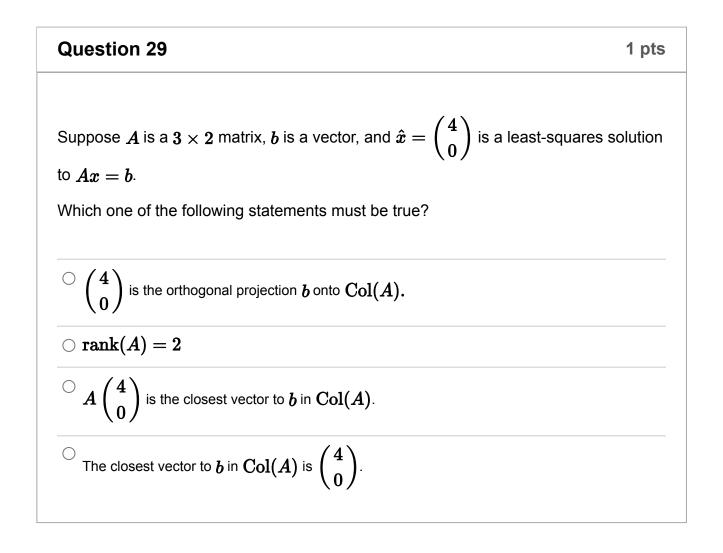
1 pts

Suppose W is a subspace of \mathbf{R}^n and x is a vector in \mathbf{R}^n satisfying

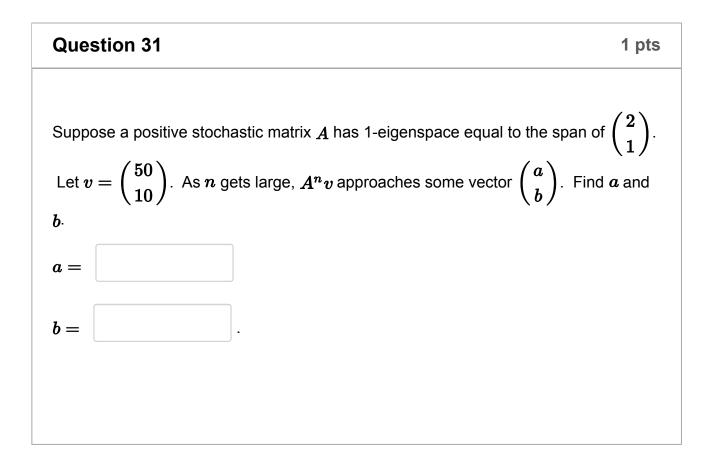
$$x_W=egin{pmatrix}7\0\0\end{pmatrix}$$
 and $x_{W^\perp}=egin{pmatrix}0\3\-4\end{pmatrix}.$

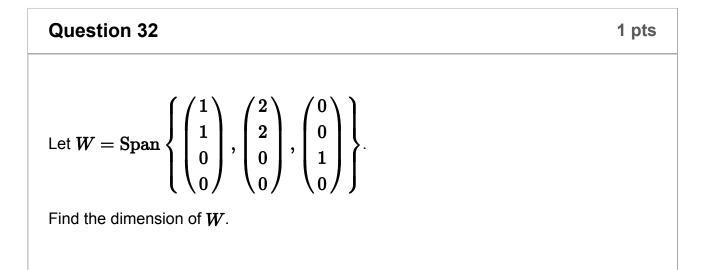
What is the distance from \boldsymbol{x} to \boldsymbol{W} ?





Let
$$W$$
 be the line $x_2 = -3x_1$ in \mathbb{R}^2 . Find the number a so that the orthogonal projection of $\begin{pmatrix} a \\ 1 \end{pmatrix}$ onto W is the zero vector.





Question 33
 1 pts

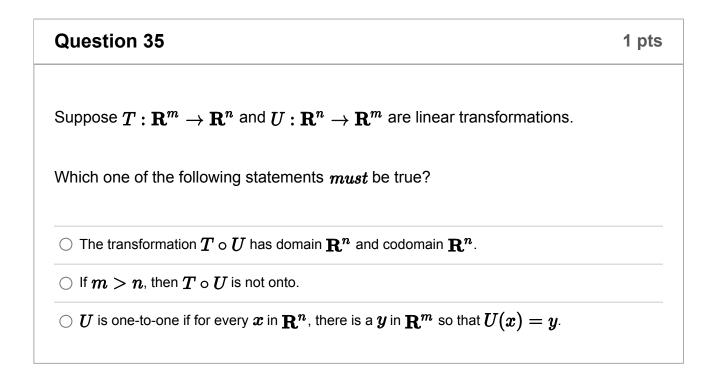
 Select the matrix A that satisfies

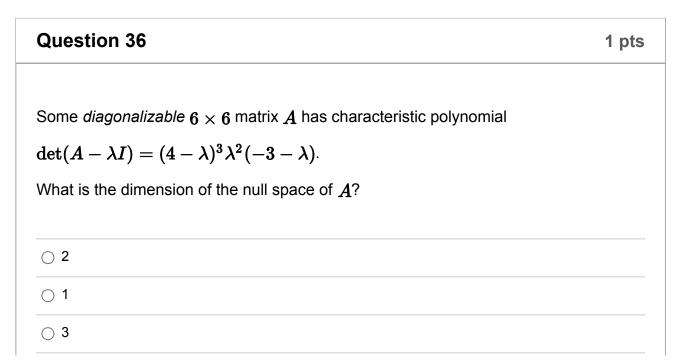
$$A\begin{pmatrix}1\\0\\1\end{pmatrix} = \begin{pmatrix}-1\\0\\-1\end{pmatrix}, A\begin{pmatrix}0\\1\\2\end{pmatrix} = \begin{pmatrix}0\\2\\4\end{pmatrix}, A\begin{pmatrix}0\\1\\0\end{pmatrix} = \begin{pmatrix}0\\-3\\0\end{pmatrix}.$$
 $\circ\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&-3\\0&0&-3\end{pmatrix}\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}^{-1}$
 $\circ\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&-3\\-1&4&0\end{pmatrix}\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}^{-1}$
 $\circ\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&0\\0&0&-3\end{pmatrix}\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}^{-1}$
 $\circ\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&0\\0&0&-3\end{pmatrix}^{-1}\begin{pmatrix}1&0&1\\0&1&2\\0&1&0\end{pmatrix}$
 $\circ\begin{pmatrix}1&0&0\\0&1&1\\0&2&0\\0&0&-3\end{pmatrix}^{-1}\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}$
 $\circ\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}\begin{pmatrix}-1&0&0\\0&2&0\\0&0&-3\end{pmatrix}^{-1}\begin{pmatrix}1&0&0\\0&1&1\\1&2&0\end{pmatrix}$
 \circ None of these

Quiz: Practice Final Exam

Find the value of *h* so that the following set of vectors is linearly dependent.

$$\left\{ \begin{pmatrix} h \\ 2 \\ 1 \end{pmatrix}, \begin{pmatrix} -3 \\ -2 \\ -1 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \right\}$$



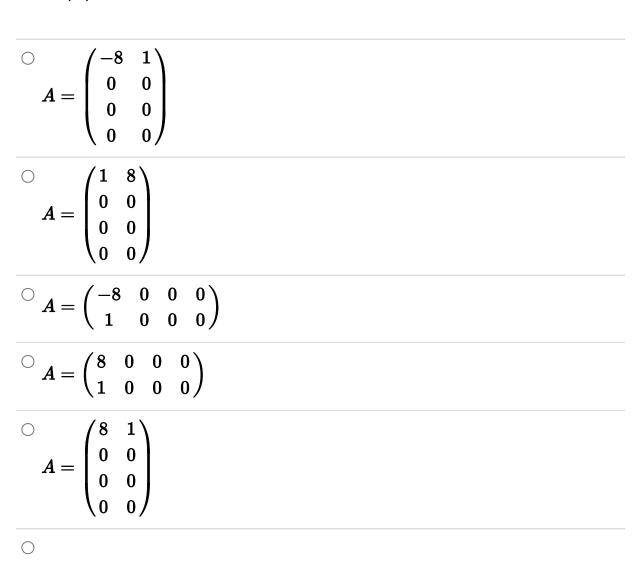


○ 4	
○ 5	
○ 6	
 Not enough information to know the answer 	

1 pts

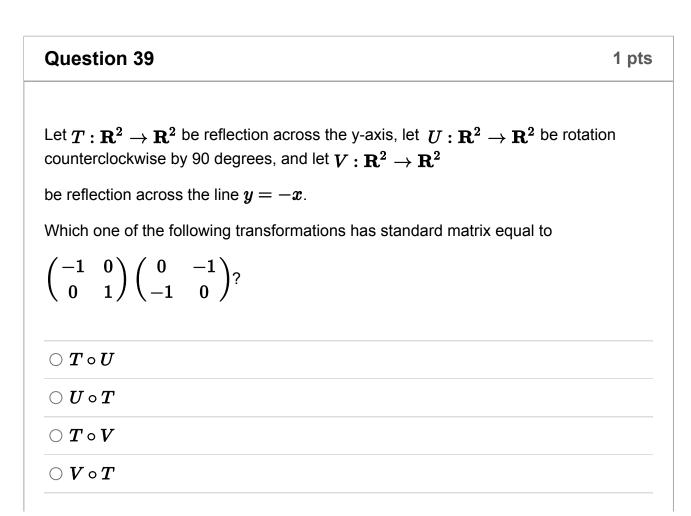
Which one of the following matrices satisfies both of the following conditions?

- 1. $\operatorname{Col}(A)$ is a subspace of \mathbb{R}^4 .
- 2. $\operatorname{Nul}(A)$ is the line $x_2 = 8x_1$ in \mathbb{R}^2 .



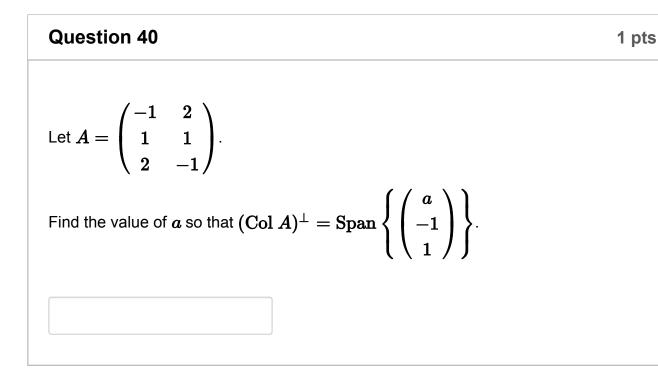


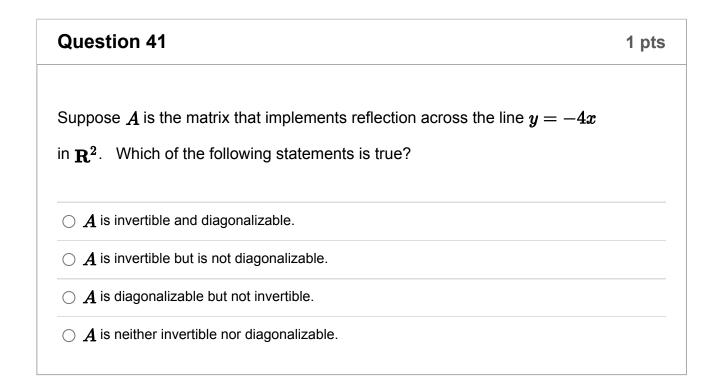
Question 381 ptsLet W be subspace of \mathbb{R}^3 consisting of all (x, y, z) satisfying x = y = z.What is the dimension of W^{\perp} ?



$$\bigcirc \boldsymbol{U} \circ \boldsymbol{V}$$

 $\bigcirc V \circ U$



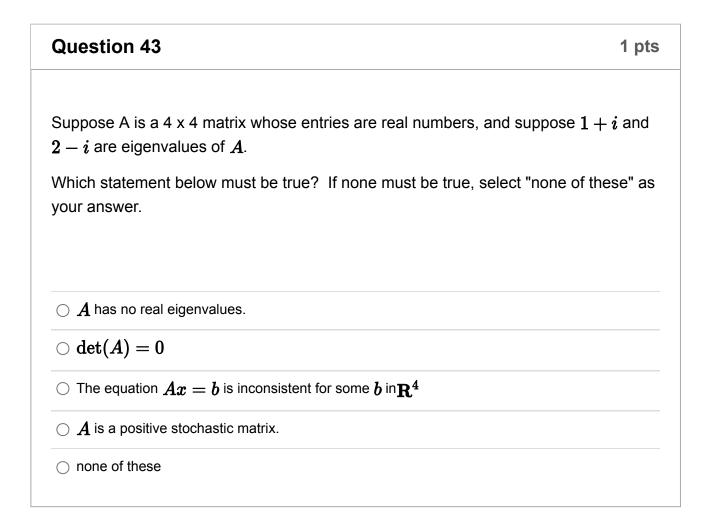


Question 42

Let *W* be the subspace of \mathbb{R}^3 consisting of all (x, y, z) in \mathbb{R}^3 satisfying x - 3y - z = 0, and let *B* be the matrix for orthogonal projection onto *W*.

Which one of the following statements must be true? If none must be true, select "none of these" as your answer.

$$rank(B) = 1 B \begin{pmatrix} 4 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 4 \\ 1 \\ 1 \end{pmatrix} W^{\perp} is a plane in \mathbb{R}^3
 The 1-eigenspace of *B* is 1-dimensional.
 None of these$$



Which of the following gives least-squares line y=Cx+D for the data points (0,1) , (2,-2), and (3,2)?

$$\begin{array}{c} \bigcirc \text{ We get C and D by solving} \\ \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix} \\ \hline \end{array}$$

$$\begin{array}{c} \bigcirc \text{We get C and D by solving} \\ \begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix} \\ \hline \end{array}$$

$$\begin{array}{c} \bigcirc \text{We get C and D by solving} \\ \begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 0 & 2 & 3 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} \\ \hline \end{array}$$

$$\begin{array}{c} \bigcirc \text{We directly solve} \\ \begin{pmatrix} 0 & 1 \\ 2 & 1 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix} \\ \hline \end{array}$$

$$\begin{array}{c} \bigcirc \text{We get C and D by solving} \\ \begin{pmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 \\ 2 & 1 \\ -2 & 1 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 0 \\ 2 \\ 3 \end{pmatrix} \\ \hline \end{array}$$

$$\begin{array}{c} \bigcirc \text{We get C and D by solving} \\ \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 2 \\ 1 & 3 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 2 \\ 1 & 3 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 2 \\ 1 & 3 \end{pmatrix} \begin{pmatrix} C \\ D \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 3 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$$

1 pts

Consider an internet with 4 pages.

Page 1 links only to page 2.

Page 2 links to pages 1 and 3.

Page 3 links to pages 2 and 4.

Page 4 links to pages 1, 2, and 3.

What is the importance matrix (also known as Google matrix) for this internet?

$igcap_{A} = egin{pmatrix} 0 & 1/2 & 0 & 1/3 \ 1 & 0 & 1/2 & 1/3 \ 0 & 1/2 & 0 & 1/3 \ 0 & 0 & 1/2 & 0 \end{pmatrix}$	
$igcap_{A} = egin{pmatrix} 0 & 1 & 0 & 0 \ 1/2 & 0 & 1/2 & 0 \ 0 & 1/2 & 0 & 1/2 \ 1/3 & 1/3 & 1/3 & 0 \end{pmatrix}$	
$egin{array}{llllllllllllllllllllllllllllllllllll$	
$igcap_{A} = egin{pmatrix} 1 & 1/2 & 0 & 1/3 \ 1 & 1 & 1/2 & 1/3 \ 0 & 1/2 & 1 & 1/3 \ 0 & 0 & 1/2 & 1 \end{pmatrix}$	
$igcap_{A} = egin{pmatrix} 1/2 & 1/3 & 0 & 1/4 \ 1/2 & 1/3 & 1/3 & 1/4 \ 0 & 1/3 & 1/3 & 1/4 \ 0 & 0 & 1/3 & 1/4 \ 0 & 0 & 1/3 & 1/4 \end{pmatrix}$	

Question 46
Let
$$T$$
 be a linear transformation such that $T\begin{pmatrix}1\\1\end{pmatrix} = \begin{pmatrix}1\\0\\-1\end{pmatrix}$ and
 $T\begin{pmatrix}1\\-1\end{pmatrix} = \begin{pmatrix}0\\-1\\-2\end{pmatrix}$. Then, $T\begin{pmatrix}2\\0\end{pmatrix} = \begin{pmatrix}a\\b\\c\end{pmatrix}$, where $a =$ ______,
 $b =$ ______ and $c =$ ______.

Question 47								1 pts
What is the determinant of	$ \left(\begin{array}{c} 1\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0 \end{array}\right) $	0 7 0 0 0 0	0 0	1 0	0 19 0 0 -1 0	0 0	?	

Question 48		1 pts
Suppose that A is a 6x7 matrix and B is a 7x6 r	natrix such that AB is the 6x6 id	entity
matrix. Is BA equal to the 7x7 identity matrix?	[Select]	
·		

Question 49	1 pts
Let S be a region in the plane with area 3. Let T be the linear transformation $T(x_1,x_2)=(x_1+x_2,x_1-x_2).$ What is the area of $T(S)$?	

Question	n 50	1 pts
You are tasl entries are h	ked with uncovering information about a secret matrix, so hidden:	me of whose
$A = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$	$\begin{pmatrix} 0 & ? \\ 2 & 4 & ? \\ 0 & 0 & 0 \end{pmatrix}$	
(the "?" repr	resent hidden entries). Given that $\mathrm{rank}(A)=2$, how ma	ny distinct
(the "?" repr	/	ny distinct
(the "?" repr eigenvalues	resent hidden entries). Given that $\mathrm{rank}(A)=2$, how ma	ny distinct
(the "?" repr eigenvalues	resent hidden entries). Given that $\mathrm{rank}(A)=2$, how ma	ny distinct

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