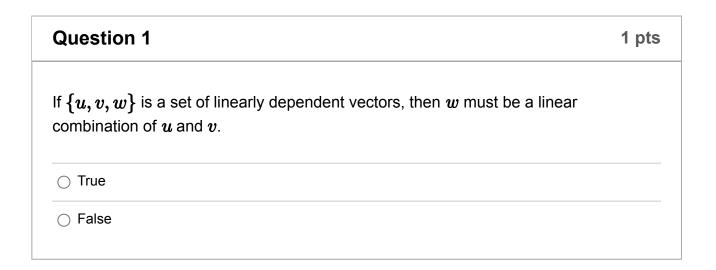
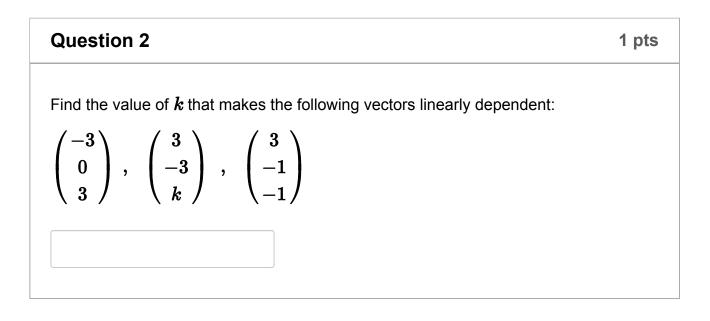
## Math 1553 Reading Day Spring 2022

 $(\ensuremath{\underline{1}})$  This is a preview of the published version of the quiz

Started: Apr 9 at 3:44pm

### **Quiz Instructions**

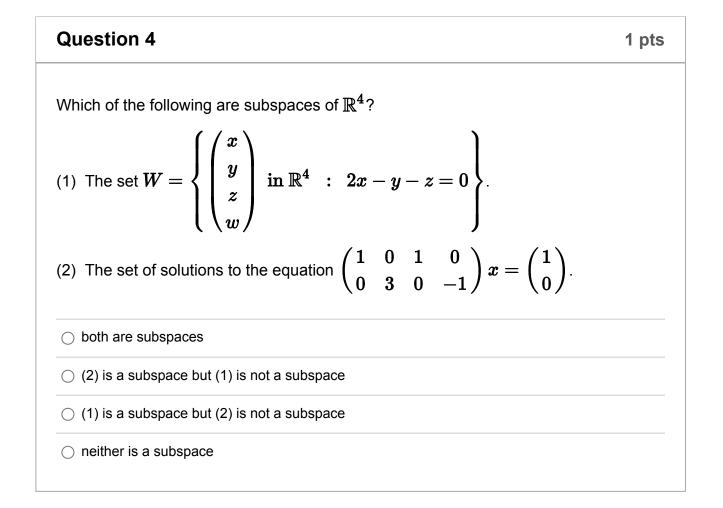


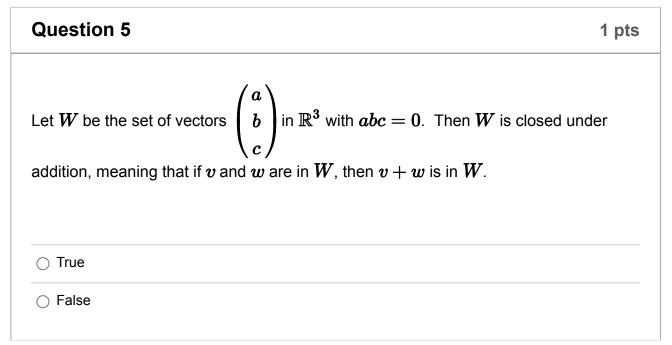


# Question 3 1 pts If $\{u,v\}$ is a basis for a subspace W, then $\{u-v,u+v\}$ is also a basis for W.

⊖ True

O False





Question	6
	-

Match the transformations given below with their corresponding 2 imes 2 matrix.

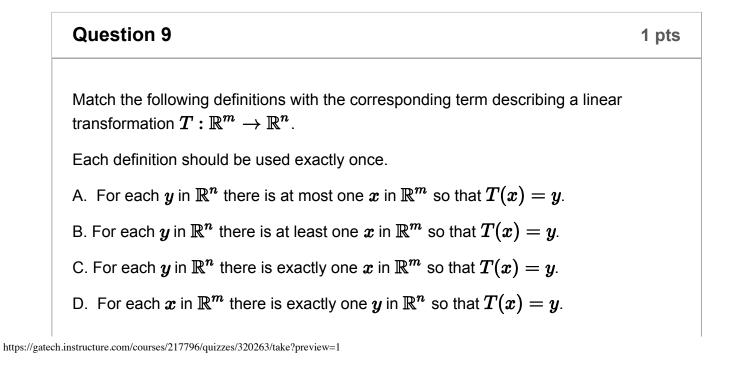
$A_{\cdot} \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$			
$B. \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$			
C. $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$			
D. $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$			
E. $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$			
Counter-clockwise rotation by 90 degrees	[ Choose ]	$\checkmark$	
Reflection about the line y=x	[Choose]	$\checkmark$	
Clockwise rotation by 90 degrees	[Choose]	$\sim$	
Reflection across the x-axis	[Choose]	$\checkmark$	
Reflection across the y-axis	[Choose]	$\sim$	

Question 7	1 pts

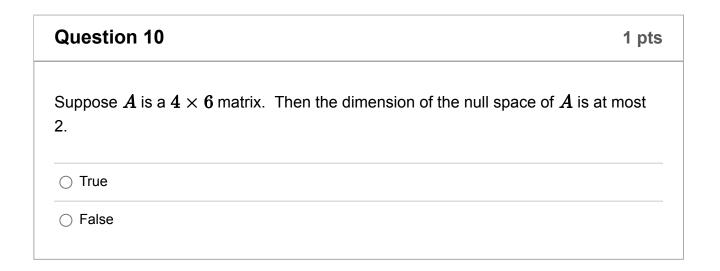
Find the value of k so that the matrix transformation for the following matrix is not onto.

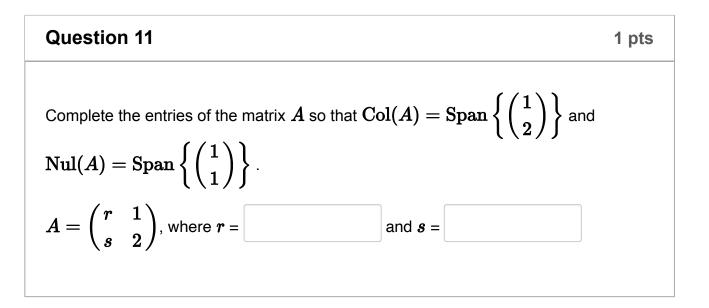
 $\begin{pmatrix} 1 & 3 & 9 \\ 2 & 6 & k \end{pmatrix}$ 

Question 8	1 pts
Find the <b>nonzero</b> value of $k$ that makes the following matrix not invertible. $\begin{pmatrix} 1 & -1 & 0 \\ k & k^2 & 0 \\ -1 & 1 & 5 \end{pmatrix}$	
Enter an integer as your answer. Note that 0 is not the correct answer, since question asks for a nonzero value of $m k$ .	e the



T is a transformation	[Choose]	$\checkmark$
T is one-to-one	[Choose]	$\checkmark$
T is onto	[Choose]	$\checkmark$
T is one-to-one and onto	[Choose]	$\checkmark$





**Question 12** 

## Suppose $T : \mathbb{R}^7 \to \mathbb{R}^9$ is a linear transformation with standard matrix A, and suppose that the range of T has a basis consisting of 3 vectors. What is the dimension of the null space of A? Question 13 1 pts Define a transformation $T : \mathbb{R}^3 \to \mathbb{R}^4$ by T(x, y, z) = (0, x - y, y - x, z). Which *one* of the following statements is true? $\Box T$ is onto but not one-to-one. $\Box T$ is one-to-one but not onto.

 $\bigcirc T$  is neither one-to-one nor onto.

 $\bigcirc m{T}$  is one-to-one and onto.

#### **Question 14**

1 pts

Suppose that A is a  $7 \times 5$  matrix, and the null space of A is a line. Say that T is the matrix transformation T(v) = Av. Which of the following statements must be true about the range of T?

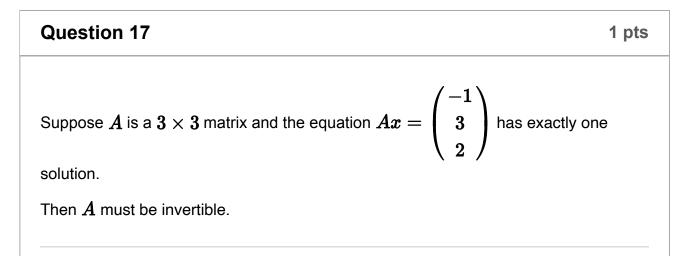
 $\bigcirc$  It is a 6-dimensional subspace of  $\mathbb{R}^5$ 

 $\bigcirc$  It is a 6-dimensional subspace of  $\mathbb{R}^7$ 

 $\bigcirc$  It is a 4-dimensional subspace of  $\mathbb{R}^5$ 

Question 15	1 pts
Say that $S:\mathbb{R}^2 o\mathbb{R}^3$ and $T:\mathbb{R}^3 o\mathbb{R}^4$ are linear transformations. Which following must be true about $T\circ S$ ?	of the
○ It is not onto	
○ It is not one-to-one	
○ The composition is not defined	
⊖ It is onto	
⊖ It is one-to-one	

Question 16	1 pts
Suppose that $A$ is an invertible $n imes n$ matrix. Then $A+A$ must be invertible	ŀ.
⊖ True	
⊖ False	



○ True

False

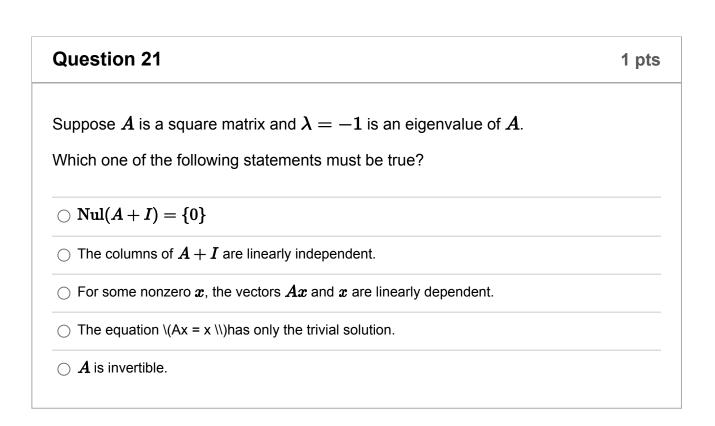
Question 18	1 pts
Suppose that $A$ and $B$ are $n~ imes n$ matrices and $AB$ is not invertible.	
Which one of of the following statements must be true?	
○ B is not invertible	
○ A is not invertible	
○ At least one of the matrices A or B is not invertible	
○ None of these	

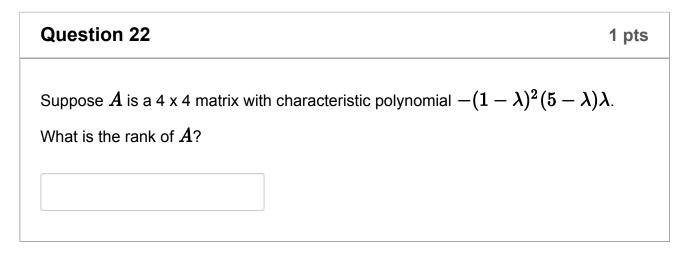
Question 19	1 pts
Suppose $A$ and $B$ are $3  imes 3$ matrices, with $\det(A) = 3$ and $\det(B) = -6$ Find $\det(2A^{-1}B)$ .	<b>i</b> .

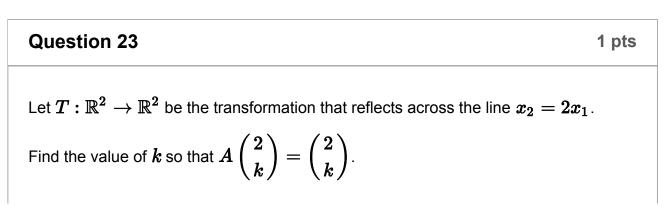
#### **Question 20**

Let A be the  $3 \times 3$  matrix satisfying  $Ae_1 = e_3$ ,  $Ae_2 = e_2$ , and  $Ae_3 = 2e_1$  (recall that we use  $e_1$ ,  $e_2$ , and  $e_3$  to denote the standard basis vectors for  $\mathbb{R}^3$ ). Find  $\det(A)$ .

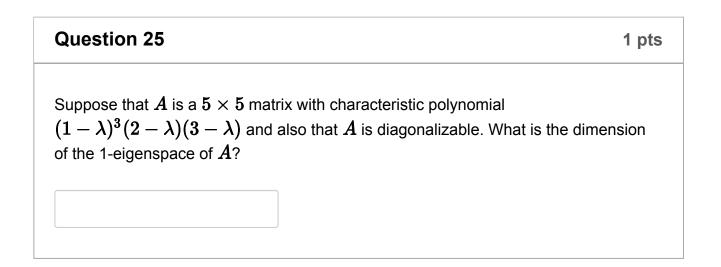
1 pts







Question 24	1 pts
Find the value of $k$ such that the matrix $\begin{pmatrix} 1 & k \\ 1 & 3 \end{pmatrix}$ has one real eigenvalue of algebraic multiplicity 2. Enter an integer value below.	



Question 26			1 pts
Find the value of $m{t}$ such that 3 is an eigenvalue of answer below.	$\begin{pmatrix} 1\\1\\3 \end{pmatrix}$	t 1 0	3 1 3). Enter an integer

#### **Question 27**

1 pts

Say that A is a  $2 \times 2$  matrix with characteristic polynomial  $(1 - \lambda)(2 - \lambda)$ . What is the characteristic polynomial of  $A^2$ ?

$egin{aligned} &\bigcirc (1-\lambda^2)(4-\lambda^2) \ &\bigcirc (1-\lambda)(4-\lambda) \ &\bigcirc (1-\lambda)(2-\lambda) \ &\bigcirc (1-\lambda^2)(2-\lambda^2) \end{aligned}$	$\bigcirc \ (1-\lambda)^2(2-\lambda)^2$	
$\bigcirc (1-\lambda)(2-\lambda)$	$\bigcirc \ (1-\lambda^2)(4-\lambda^2)$	
	$\bigcirc (1-\lambda)(4-\lambda)$	
$\bigcirc \ (1-\lambda^2)(2-\lambda^2)$	$\bigcirc (1-\lambda)(2-\lambda)$	
	$\bigcirc (1-\lambda^2)(2-\lambda^2)$	

#### **Question 28**

1 pts

Suppose that a vector x is an eigenvector of A with eigenvalue 3 and that x is also an eigenvector of B with eigenvalue 4. Which of the following is true about the matrix 2A - B and x:

 $\bigcirc x$  is an eigenvector of 2A - B with eigenvalue 3

- $\bigcirc x$  is an eigenvector of 2A-B with eigenvalue 1
- $\bigcirc x$  is an eigenvector of 2A-B with eigenvalue 2

#### None of these

 $\bigcirc \boldsymbol{x}$  is an eigenvector of  $\boldsymbol{2A}-\boldsymbol{B}$  with eigenvalue 4

**Ougstion 29** 

Question 29	1 pts
Suppose that $A$ is a $4 imes 4$ matrix with eigenvalues 0, 1, and 2, where 1 has algebraic multiplicity two.	the eigenvalue
Which of the following must be true?	
(1) $oldsymbol{A}$ is not diagonalizable	
(2) $oldsymbol{A}$ is not invertible	
$\bigcirc$ (1) must be true but (2) might not be true	
$\bigcirc$ Both (1) and (2) must be true	
$\bigcirc$ (2) must be true but (1) might not be true	
○ Neither statement is necessarily true	

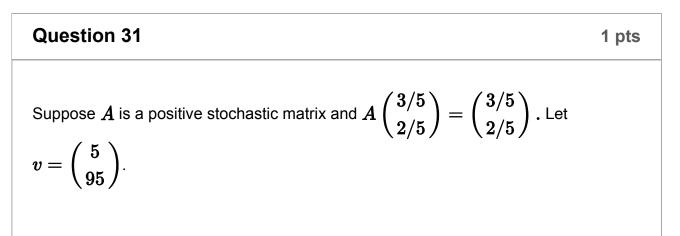
#### **Question 30**

1 pts

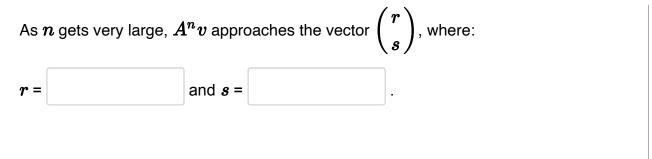
Suppose A is a  $5 \times 5$  matrix whose entries are real numbers. Then A must have at least one real eigenvalue.

⊖ True

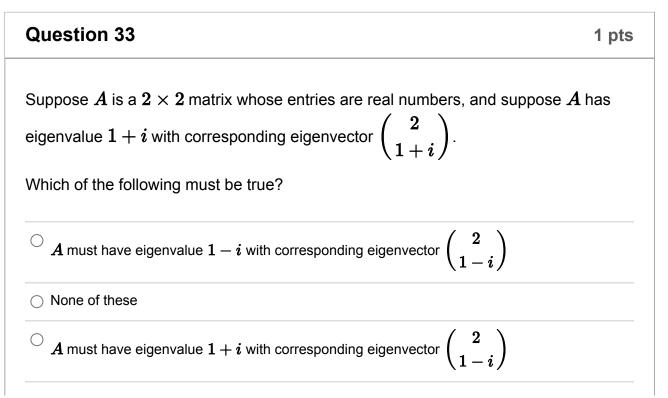
○ False



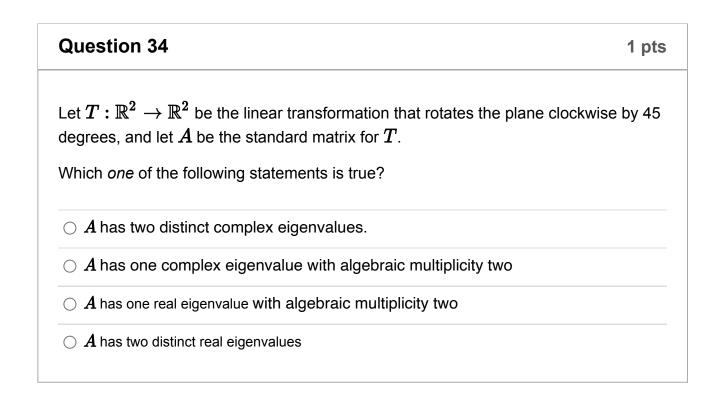
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Question 32	1 pts
Suppose that $A$ is a $4 imes 4$ matrix of rank 2. Which one of the following staten must be true?	nents
$\bigcirc oldsymbol{A}$ must have four distinct eigenvalues	
$\bigcirc oldsymbol{A}$ is not diagonalizable	
$\bigcirc$ none of these	
$\bigcirc oldsymbol{A}$ cannot have four distinct eigenvalues	
$\bigcirc oldsymbol{A}$ is diagonalizable	



 $m{A}$  must have eigenvalue 1-i with corresponding eigenvector



#### **Question 35**

1 pts

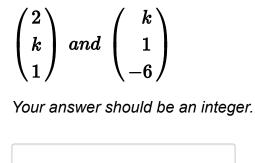
Suppose u and v are orthogonal unit vectors (to say that a vector is a unit vector means that it has length 1). Find the dot product

 $(3u-8v)\cdot 4u$ 

#### **Question 36**

1 pts

Find the value of k that makes the following pair of vectors orthogonal.



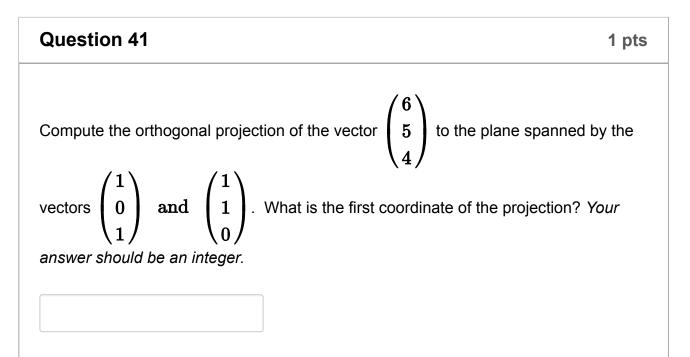
Question 37	1 pts
If $W$ is a subspace of $\mathbb{R}^{100}$ and $v$ is a vector in $W^{\perp}$ then the orthogonal proje of $v$ to $W$ must be the $0$ vector.	ction
⊖ True	
⊖ False	

Question 38	1 pts
Suppose $W$ is a subspace of $\mathbb{R}^n$ . If $x$ is a vector and $x_W$ is the orthogonal projection of $x$ onto $W$ , then $x \cdot x_W$ must be 0.	
⊖ True	
⊖ False	

Question 39	1 pts
Suppose that $A$ is a $3 imes 3$ invertible matrix. What is the dot product betwee second row of $A$ and third column of $A^{-1}$ equal to?	en the

○ 2				
O Not End	ough Informatior	n is Given		
<b>○</b> -2				
0 0				
○ -1				
○ 1				

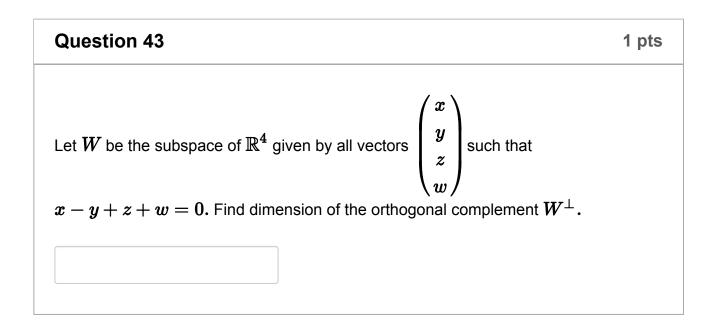
Question 40	1 pts
Find the orthogonal projection of $egin{pmatrix} 0 \\ 1 \end{pmatrix}$ onto ${f Span}\left\{egin{pmatrix} 1 \\ 2 \end{pmatrix} ight\}.$	
The orthogonal projection is $\begin{pmatrix} a \\ b \end{pmatrix}$ , where: $a = \begin{bmatrix} a \\ b \end{bmatrix}$ and $b = \begin{bmatrix} a \\ b \end{bmatrix}$	=
Enter integers or fractions as your entries.	

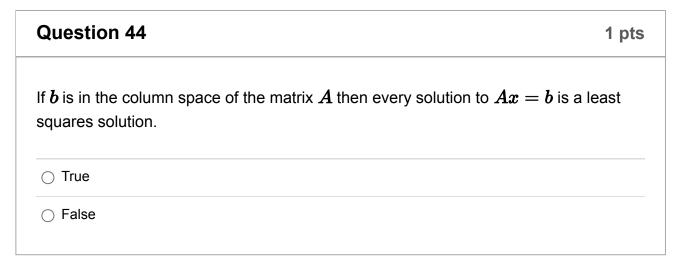


1 pts

#### **Question 42**

Suppose B is the standard matrix for the transformation  $T: \mathbb{R}^3 \to \mathbb{R}^3$  of orthogonal projection onto the subspace  $W = \left\{ \begin{pmatrix} x \\ y \\ z \end{pmatrix} \text{ in } \mathbb{R}^3 \mid x + y + 2z = 0 \right\}$ . What is the dimension of the 1-eigenspace of B?





Question 45	1 pts
If $A$ is an $m imes n$ matrix, $b$ is in $\mathbb{R}^m$ , and $\hat{x}$ is a least squares solution to $\Delta$ then $\hat{x}$ is the point in $\mathrm{Col}(A)$ that is closest to $b$ .	4x = b,
⊖ True	
⊖ False	

Question 461 ptsFind the least squares solution  $\hat{x}$  to the linear system $\begin{pmatrix} 6 \\ -2 \\ -2 \end{pmatrix} x = \begin{pmatrix} 14 \\ -2 \\ 0 \end{pmatrix}$ If your answer is an integer, enter an integer.If your answer is not an integer, enter a fraction.

Question 47		1 pts
Find the best fit line y= $(-7, -22), (0, -2), \text{ and } (7, 6)$	x+ using the method of l	for the data points least squares. <i>Your answers</i>
should both be integers.		

#### **Question 48**

Let 
$$A = \begin{pmatrix} 4 & 1 \\ 5 & 2 \end{pmatrix} \begin{pmatrix} -3 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} 4 & 1 \\ 5 & 2 \end{pmatrix}^{-1}$$
.  
Find  $r$  and  $s$  so that  $A^3 \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} r \\ s \end{pmatrix}$ .  
 $r =$ 

Question 49	1 pts
If $A$ is a diagonalizable $6 imes 6$ matrix, then $A$ has $6$ distinct eigenvalues.	
⊖ True	
⊖ False	

Question 50	1 pts
Find the eigenvalues of the matrix $A=egin{pmatrix} 1&4\4&7 \end{pmatrix}$ and write them in increasing	g order.
The smaller eigenvalue is $\lambda_1$ = .	
The larger eigenvalue is $\lambda_2$ = .	

Not saved