Homework Quiz 6

Due 3 Nov at 6:00 **Points** 210 **Questions** 22
Available 27 Oct at 6:00 - 3 Nov at 6:00 **Time limit** None

This quiz was locked 3 Nov at 6:00.

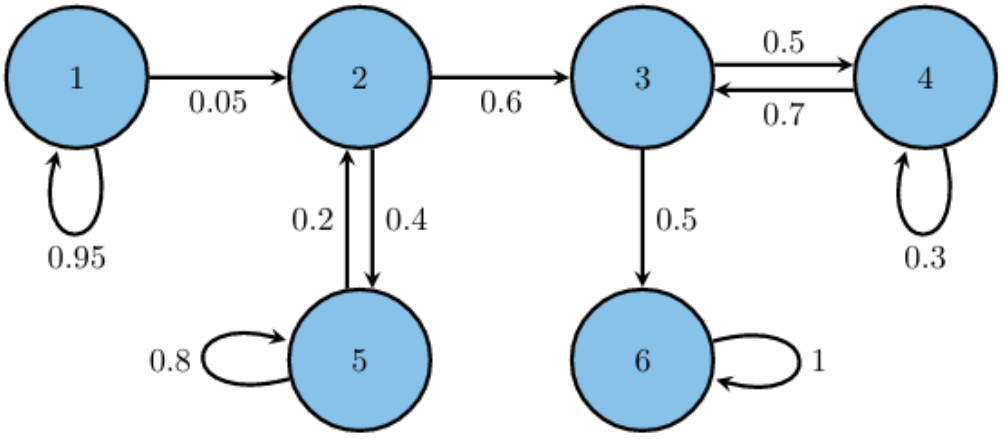
Attempt history

	Attempt	Time	Score
LATEST	Attempt 1	362 minutes	203.33 out of 210

Score for this quiz: **203.33** out of 210
Submitted 3 Nov at 3:25
This attempt took 362 minutes.

Question 1

10 / 10 pts



In the Markov chain shown above, if $\boldsymbol{s}(5) = \begin{bmatrix} 0.2 \\ 0.3 \\ 0.1 \\ 0.2 \\ 0.2 \\ 0 \end{bmatrix}$ what is the value of $s_2(6)$?

Correct!

0.05

orrect Answers

0.05 (with margin: 0.001)

Question 2

5 / 5 pts

State 1 from the previous problem is an absorbing state.

True

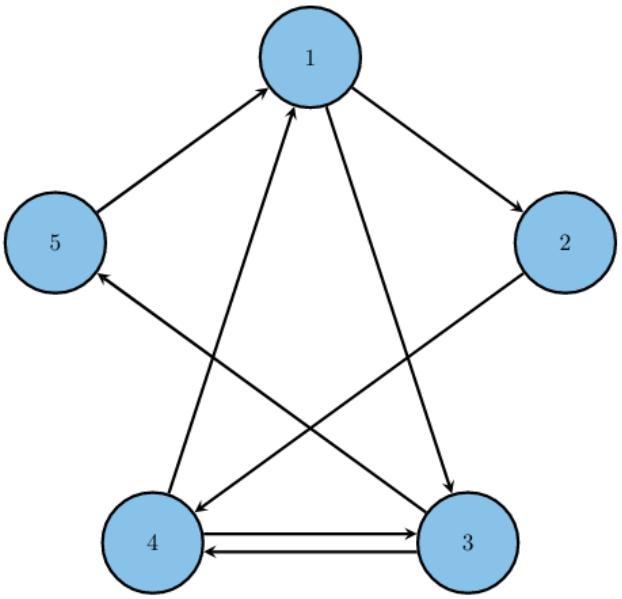
Correct!

False

Question 3

10 / 10 pts

Consider the PageRank network below with $d = 0.5$. Using Markov chain analysis, what is the value of the free variable such that $(I - P^T)\boldsymbol{s}^\star = \mathbf{0}$ and $\sum_i s_i^\star = 1$? Remember to first construct the Hyperlink matrix H, then use H to construct P. Enter your answer to 4 decimal places. (Hint: an example is done in section 2.2 of the Markov chain case study)



Correct!

0.1543

orrect Answers

0.1543 (with margin: 0.001)

Question 4

5 / 5 pts

Why can the Markov chain interpretation of Page Rank have self-loops even though the underlying network has no self-links?

- The Markov chain interpretation is independent of the underlying network.
- The Markov chain interpretation cannot have self-loops if the underlying network has no self-links.

Correct!

- When $d<1$, there is a nonzero probability that we don't leave a page.
- Markov chains need self-loops to function.

Question 5

10 / 10 pts

Which of the following collections of vectors from the exercises in section 1.7 in the Lay text are linearly independent? Check all that apply.

Correct!

- [x] The columns of the matrix in Exercise 6: $\begin{bmatrix} -4 & -3 & 0 \\ 0 & -1 & 4 \\ 1 & 0 & 3 \\ 5 & 4 & 6 \end{bmatrix}$
- [ ] The collection in Exercise 16: $\begin{bmatrix} 4 \\ -2 \\ 6 \end{bmatrix}, \begin{bmatrix} 6 \\ -3 \\ 9 \end{bmatrix}$
- [ ] The collection in Exercise 20: $\begin{bmatrix} 1 \\ 4 \\ -7 \end{bmatrix}, \begin{bmatrix} -2 \\ 5 \\ 3 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$
- [ ] The collection in Exercise 18: $\begin{bmatrix} 4 \\ 4 \end{bmatrix}, \begin{bmatrix} -1 \\ 3 \end{bmatrix}, \begin{bmatrix} 2 \\ 5 \end{bmatrix}, \begin{bmatrix} 8 \\ 1 \end{bmatrix}$

Correct!

- [x] The collection in Exercise 2: $\begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 5 \\ -8 \end{bmatrix}, \begin{bmatrix} 3 \\ 4 \\ 1 \end{bmatrix}$

Correct!

- [x] The collection in Exercise 4: $\begin{bmatrix} -1 \\ 4 \end{bmatrix}, \begin{bmatrix} -2 \\ -8 \end{bmatrix}$
- [ ] The columns of the matrix in Exercise 8: $\begin{bmatrix} 1 & -3 & 3 & -2 \\ -3 & 7 & -1 & 2 \\ 0 & 1 & -4 & 3 \end{bmatrix}$

Question 6

10 / 10 pts

Two non-zero vectors in R^3 are linearly dependent if and only if they both lie on the same line through the origin.

Correct!

- (•) True

False

Question 7

10 / 10 pts

If vectors x, y, and z are such that z belongs to span{x,y}, then the collection

{x,y,z} must be linearly dependent.

Correct!

- (•) True
- ( ) False

Question 8

10 / 10 pts

If the columns of a matrix are linearly dependent, then the matrix must have more columns than rows.

- ( ) True

Correct!

- (•) False

Question 9

10 / 10 pts

If a collection of vectors in R^n contains the zero vector, then the collection must be linearly dependent.

Correct!

- (•) True

False

Question 10

10 / 10 pts

If the third column of a 4x4 matrix is not a linear combination of the other three columns, then the columns of this matrix must be linearly independent.

True

Correct!

False

Question 11

10 / 10 pts

If the set of vectors $\{v_1, v_2, v_3, v_4, v_5\}$ is linearly independent, then so is $\{v_1, v_2, v_4, v_5\}$.

Correct!

True

False

Question 12

10 / 10 pts

A = [1 -3 2; 0 1 -4; 3 -5 -9]

b = [6; -7; -9]

Suppose T() is defined by T(x) = Ax. Find a vector x whose image under T is b, and determine whether x is unique.

x = [5 ; 3 ; -1] and the answer is unique.

Correct!

x = [-5 ; -3 ; 1] and the answer is unique.

x = [-5 ; -3 ; 1] and the answer is not unique.

x = [5 ; 3 ; -1] and the answer is not unique.

Question 13

10 / 10 pts

A = [1 -2 1; 3 -4 5; 0 1 1; -3 5 -4]
b = [1; 9; 3; -6]
Suppose T() is defined by T(x) = Ax. Find a vector x whose image under T is b, and determine whether x is unique.

Correct!

x = [1 ; 1 ; 2] and the answer is not unique.

x = [7 ; 3 ; 0] and the answer is unique.

x = [-3 ; -1 ; 1] and the answer is not unique.

x = [1 ; 1 ; 2] and the answer is unique.

Question 14

10 / 10 pts

Suppose T is a linear transformation from R^3 to R^2, and suppose $T(e_1)$= [1;2], $T(e_2)$=[4;-8], and $T(e_3)$=[-6;4],

where e_1, e_2, and e_3 denote the columns of the 3x3 identity matrix from left to right. What is the matrix of this transformation T?

There is no matrix for this transformation.

[1 2 ; 4 -8 ; -6 4]

Correct! [1 4 -6 ; 2 -8 4]

[-6 4 1 ; 4 -8 2]

Question 15

10 / 10 pts

Suppose T is a linear horizontal shear transformation from R^2 to R^2 that leaves e_1 unchanged but maps e_2 into $3e_1+e_2$ (here e_1 and e_2 denote the columns of the 2-by-2 identity matrix from left to right). What is the matrix of this transformation T?

There is no matrix for this transformation.

[1 0 ; 1 3]

[1 3 0; 0 1 0 ; 0 0 1]

Correct! [1 3 ; 0 1]

Question 16

10 / 10 pts

Suppose T is the linear transformation from R^2 to R^2 that first reflects points about the vertical axis and then rotates points counterclockwise by 90 degrees. What is the matrix of this transformation T?

Correct! [0 -1 ; -1 0]

There is no matrix for this transformation.

[0 1 ; 1 0]

[-1 0 ; 0 -1]

Question 17

10 / 10 pts

A = [0 0 0 0; 1 1 0 0; 0 1 1 0; 0 0 1 1]

The transformation T(x)=Ax is:

- both one-to-one and onto
- onto but not one-to-one
- one-to-one but not onto
- Correct! neither one-to-one nor onto

Question 18

10 / 10 pts

A = [1 -5 4; 0 1 -6]

The transformation T(x)=Ax is:

- Correct! onto but not one-to-one
- neither one-to-one nor onto
- both one-to-one and onto
- one-to-one but not onto

Question 19

10 / 10 pts

Suppose A is a 4-by-7 matrix. Then the transformation T(x)=Ax is:

- onto but not one-to-one
- both one-to-one and onto
- one-to-one but not onto
- neither one-to-one nor onto
- not enough information is provided

Correct!

Question 20

10 / 10 pts

Suppose A is a matrix such that rref(A) is the identity matrix. Then the transformation T(x)=Ax is:

- not enough information is provided
- neither one-to-one nor onto
- onto but not one-to-one
- both one-to-one and onto
- one-to-one but not onto

Correct!

Question 21

10 / 10 pts

If a matrix A is 3x6 and the product AB is 3x2, then what is the size of B?

- 2x6

- 6x3
- 6x2 (Correct!)
- 3x3
- 3x2
- 3x6

Question 22

3.33 / 10 pts

Assume you are given the linear transformations T1, T2, T3, T4, T5 with corresponding matrices:

```
A1 = [1  0; 0 -1]
```

```
A2 = [-1 0; 0 1]
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```
A3 = [0 -1;-1 0]
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```
A4 = [2  0; 0 1]
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A5 = [1  0; 0 2]
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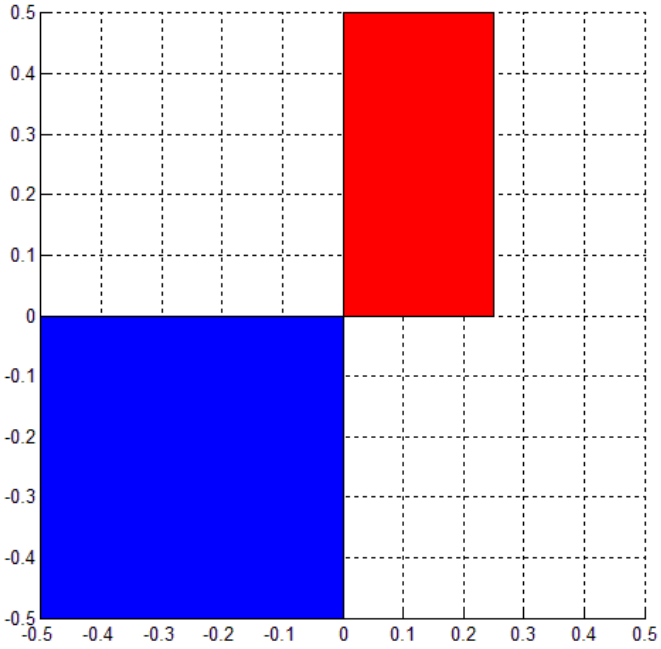
Select all possible sequences of transformations that would transform the red rectangle into the blue rectangle, in the provided image below. Note: transformations are applied in the order they are presented.



Correct!

- [x] T4 -> T2 -> T1
- [ ] T5 -> T1 -> T2

Correct!

- [x] T4 -> T1 -> T2

ou Answered

- [x] T3 -> T4

orrect answer

- [ ] T3 -> T5
- [ ] T4 -> T5 -> T3

Quiz score: **203.33** out of 210