**Linear Algebra. Final exam. Variant 2.**

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| --- | --- | --- | --- | --- |
| First name | Last name | Group | Points#1 | Points#2 |
|  |  | BS1- |  |  |

I am, \_\_\_\_\_ (initials), confirming that I have read the following rules and agree to comply with them, that all solutions on this paper is my own work.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (signature)

Rules:

* no talking AT ALL is allowed during the exam and after it (if you are still in the room)
* when time is up, you have to put down your pen (pencil) and do NOT write anything else
* you can NOT leave your seat till the end of the test
* any electronic devices are not allowed

1. (5 points) What values of α produce instability (divergence) the solution of the next difference system:



1. (4 points) Find for .

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| First name | Last name | Group | Points#3 | Points#4 |
|  |  | BS1- |  |  |

I am, \_\_\_\_\_ (initials), confirming that I have read the following rules and agree to comply with them, that all solutions on this paper is my own work.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (signature)

1. (5 points) For which α and β quadratic form is positive definite:
2. (5 points) Write down the first order equation system for the following differential equation and solve it:



(1 points) Is the solution of this system will be stable?

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| First name | Last name | Group | Points#5 | Points#6 |
|  |  | BS1- |  |  |

I am, \_\_\_\_\_ (initials), confirming that I have read the following rules and agree to comply with them, that all solutions on this paper is my own work.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (signature)

1. (5 points) Write down the matrix of the linear transformation, which performs the following:  
   - rotation around the axis *x = y = z* on the angle φ = ‑2π/3.
2. (5 points) Find the SVD and the pseudoinverse of the matrix 

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| First name | Last name | Group | Points#9 | Points#10 |
|  |  | BS1- |  |  |

I am, \_\_\_\_\_ (initials), confirming that I have read the following rules and agree to comply with them, that all solutions on this paper is my own work.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (signature)

1. (4 points) Prove that *AB* = *BA* if these square matrices have the same complete set of eigenvectors but different eigenvalues.
2. (6 points) Prove that any real square matrix can be factored into *A* = *QS*, where *Q* is orthogonal and *S* is symmetric positive semidefinite.