This course requires a performance assessment. It covers 5 competencies.

**Introduction**

**Overview**

Linear Algebra extends the study of linear equations to three- or higher-dimensional space. It covers the knowledge and skills necessary to apply vectors, matrices, matrix theorems, and linear transformations and to use appropriate technology to model and solve real-life problems. It also covers properties of and proofs about vector spaces. Topics include:

- linear equations and their matrix-vector representation $Ax=b$;
- row reduction;
- linear transformations and their matrix representations (shear, dilation, rotation, reflection);
- matrix operations;
- matrix inverses and invertible matrix characterizations;
- computing determinants;
- relating determinants to area and volume; and
- axiomatic and intuitive definitions of vector spaces and subspaces and how to prove theorems about them.

College Geometry and Calculus III are prerequisites for this course.

**Getting Started**

Welcome to Linear Algebra!

Logical reasoning and proofs underlie the main concepts of higher mathematics in subjects such as Linear Algebra and Abstract Algebra. In the Logic portion of this course, you will consider the relationship between the truth of one statement and the truth of other related statements. To avoid the ambiguities of natural languages such as English, logic uses formal languages with precisely defined symbols. In this course, you will learn about both Propositional Logic and Predicate Logic. To master the competencies for the Logic portion of the course, you will work through sections in the first section of *Discrete Mathematics* by Sandy Irani et al. published as an interactive ebook by ZyBooks. You should read through all of the assigned sections and work through the interactive examples and exercises in those sections. You will demonstrate your competency in Logic by successfully completing two tasks: one on Propositional Logic and one on Predicate Logic.

The Linear Algebra portion of the course addresses systems of equations, matrix operations and characteristics, vector spaces, and linear transformations. While this course has some similarity to the basic algebra of real numbers that you learned in the past, it is a bit different
because it moves up into problem solving in higher dimensions. Learning linear algebra will reinforce the importance of the principles and concepts of the algebra you already know. To master the competencies for Linear Algebra, you will typically watch a video from an external Website that summarizes a major idea from Linear Algebra. Then you will check your understanding by doing some of the homework diagnostics from the interactive "MathLab" portion of your textbook. When you do a diagnostic, you can practice what you got wrong by either going to Review Results or by using the Pearson Study Plan. While reviewing, you can always access the relevant readings from the online textbook, *Lay's Linear Algebra, 4th edition*. Most of the time, you will also be able to access learning aids such as worked examples or interactive step-by-step solutions of the problems you are working on. You will demonstrate your competency in Linear Algebra by successfully completing two tasks: one on Matrices and Linear Transformations, and one on Vector Spaces. The topics for these two tasks are spread throughout the book. You will be working on different parts of these tasks as you study and complete the course activities.

**Teaching Dispositions Statement**
Please review the [WGU Statement of Teaching Dispositions](#).

**Competencies and Objectives**
This course provides guidance to help you demonstrate the following 3 competencies:

- **Competency 209.8.4: Vector Spaces**

The graduate demonstrates understanding of the properties and characteristics of vector spaces.

- Define the concept of vector space.

- Indicate whether a given mathematical object is a vector space.

- Determine whether or not a given set of vectors is linearly independent.

- Determine the span of a given vector space.

- Define a subspace of a given vector space.

- Determine whether or not a particular vector is in a given column space.

- Determine the null space for a given vector space.

- Determine the basis of a given vector space.

- Determine the dimension of a given subspace.

- Prove a given theorem of important results in linear algebra.
• **Competency 209.8.5: Linear Transformations**

The graduate demonstrates understanding of linear transformations and their applications.

- Identify the matrix that represents a given linear transformation.
- Define the concept of a one-to-one mapping.
- Apply linear transformations to convert given data.
- Describe the effect of linear transformations on measures of central tendency.
- Describe the effect of linear transformations on measures of dispersion.

• **Competency 209.8.6: Matrices**

The graduate applies matrix theory and matrix algebra to model and solve problems.

- Identify the image of a point under a given linear transformation of the xy-plane using matrix multiplication.
- Compute the determinant of a 2x2 matrix.
- Compute the inverse of a 2x2 matrix.
- Distinguish the value of a given matrix as either invertible or non-invertible.
- Identify the area of the transformed region after being given a region of the xy-plane and a linear transformation of the xy-plane.

• **Competency 209.8.7: Propositional Logic**

The graduate applies propositional logic to solve mathematical problems.

- Select propositions from a collection of sentences.
- Configure propositional logic from a propositional sentence.
- Configure a propositional sentence from propositional logic.
- Identify the contrapositive, the converse, and the inverse of the conditional statement.
- Construct a truth table for compound propositions.
- Configure a logical expression from a truth table.
• Identify whether two given propositions are logically equivalent.

• Identify whether a given proposition is a tautology, a contradiction, or neither.

• **Competency 209.8.8: Predicate Logic**

The graduate applies predicate logic to solve mathematical problems.

• Convert sentences into propositions.

• Convert sentences into predicates.

• Identify the truth value for universally quantified statements.

• Identify truth values for existentially quantified statements.

• Simplify quantified statements using De Morgan's laws

• Identify truth values for statements with nested quantifiers.

**Preparing for Success**

The information in this section is provided to detail the resources available for you to use as you complete this course.

**Learning Resources**

The learning resources listed in this section are required to complete the activities in this course. For many resources, WGU has provided automatic access through the course. However, you may need to manually enroll in or independently acquire other resources. Read the full instructions provided to ensure that you have access to all of your resources in a timely manner.

Please make sure the following links function properly for you:

• In the Logic portion of the course, [Textbook](#) leads to Chapter 1 of *Discrete Mathematics* published by ZyBooks.

• In the Linear Algebra portion, [Textbook](#) leads to the Table of Contents for *Lay's Linear Algebra, 5th Edition*, published by Pearson.

• [Homework](#) goes into Pearson's MyMathLab and lists 10 assignments from section 1.1 to 4.1.

• [Diagnostic](#) goes into a nearby portion of MyMathLab and lists two quiz-like assignments, one for Foundations and one for the Matrix Task.

• [Review Results](#) gives you an opportunity to practice what you missed on Diagnostics and Homework and includes links to interactive worked solutions, similar examples, and readings from the textbook.

• [Pearson Study Plan](#) is an alternative to Review Results; it focuses on learning objectives you missed on the Diagnostics, but also throws in continuous review of all textbook...
topics—not recommended for this course, but available for your reference.

**Seek Help When You Need It**

Your Course Instructor is an important resource for you to take advantage of as you progress through your study of Linear Algebra. Your Course Instructor will be able to help guide your learning, answer questions, and provide valuable information. Be sure to consult your Course Instructor frequently.

**Pacing Guide**

The suggested schedule for completing the course:

**Week 1:**
- Propositional Logic, Complete and Submit Task 1

**Week 2:**
- Predicate Logic, Complete and Submit Task 2

**Week 3:**
- Linear Equations, Matrix Equations, Matrix of a Linear Transformation, Begin Task 3

**Week 4:**
- Inverse of a Matrix, Characterization of Invertible Matrices, Determinants, Complete and Submit Task 3

**Week 5:**
- Vector Spaces, Begin Task 4

**Week 6:**
- Subspaces, Complete and Submit Task 4

**Supplemental Activities**

There might be times when you feel like you need more information or practice than what has been provided in the course. In addition to consulting with your Course Instructor when you need help, you can access optional and supplemental activities by using the word "supplemental" in the Course Search box. These activities can be enriching, but they are not essential for becoming competent.

**Graphing Calculator**

If you don't already have one, acquire an appropriate calculator for use on WGU exams. There is no exam for this course, but it's good to learn how to use your calculator to solve problems in
this course. Watch the YouTube video "Matrix Operations on the TI-83+ TI-84+" until 2:30 to learn how to enter matrices and vectors on a TI. If you own a different kind of calculator, make sure you learn how to do this on yours.

Logic

The study of arguments and inference is known as logic. The Greek philosopher, Aristotle, brought focus to the study of logic, and the topic saw significant growth in the early 20th century. Logic uses formal languages with precisely defined symbols.

Propositional Logic

This section ponders the connection between the truth of one statement and the truth of other related statements. Complete the following.

Propositions and Logical Operations

Read the following and work through Participation Activities 1.1.1 through 1.1.6:

- **1.1 Propositions and logical operations**

Do the following:

- **Exercises 1.1.1–1.1.4**

Compound Propositions

Read the following and work through Participation Activities 1.2.1 through 1.2.5 and Challenge Activities 1.2.1 and 1.2.2:

- **1.2 Propositions and logical operations**

Do the following:

- **Exercises 1.2.1–1.2.6**

Conditional Statements

Read the following and work through Participation Activities 1.3.1 through 1.3.5 and Challenge Activities 1.3.1 and 1.3.2:

- **1.3 Conditional Statements**

Do the following:

- **Exercises 1.3.1–1.3.4**

Logical Equivalence

Read the following and work through Participation Activities 1.4.1 through 1.4.6:

- **1.4 Logical Equivalence**
Do the following:

- **Exercises 1.4.1–1.4.5**

Submit Task 1

When you have completed all parts of this section, you may submit Task 1 to Taskstream. If you do not pass the Task, meet with your Course Instructor.

### Predicate Logic

In this section, predicate logic builds on propositional logic by adding variables and quantifiers. In addition to the propositional logic symbols and \( \land, \lor, \neg \) and \( \equiv \); predicate logic also uses two quantifiers: \( \forall \) which is interpreted as “for all” and \( \exists \) which is interpreted as “there exists.” By quantifying a variable or assigning a value to it, a statement in predicate logic can be made into a proposition. Complete the following.

#### Predicates and Quantifiers

Read the following and work through Participation Activities 1.6.1 through 1.6.7:

- **1.6 Predicates and Quantifiers**

Do the following:

- **Exercises 1.6.1–1.6.4**

#### Quantified Statements

Read the following and work through Participation Activities 1.7.1 through 1.7.5 and Challenge Activity 1.7.1:

- **1.7 Quantified Statements**

Do the following:

- **Exercises 1.7.1–1.7.6**

#### De Morgan's Law for Quantified Statements

Read the following and work through Participation Activities 1.8.1 through 1.8.3:

- **1.8 De Morgan's Law for Quantified Statements**

Do the following:

- **Exercises 1.8.1–1.8.4**

#### Nested Quantifiers

Read the following and work through Participation Activities 1.9.1 through 1.9.6:
Do the following:

- **1.9 Nested Quantifiers**

Submit Task 2

When you have completed all parts of this section, you may submit Task 2 to TaskStream. If you do not pass the Task, meet with your Course Instructor.

Linear Algebra

Systems of equations, matrix operations and characteristics, vector spaces, and linear transformations are addressed in linear algebra. Linear Algebra is used in computer science, engineering, statistics, economics and other fields.

**Preparation and Linear Algebra Foundations**

This section provides a solid foundation in the geometry of linear equations and how to use matrix equations to represent and solve systems of linear equations. Complete the following.

**Self-evaluation of Foundations**

If you have a good background in vectors and matrices and their relationship to solving linear systems of equations, try the Linear Algebra Foundations Diagnostic. If you score above 70%, you can probably go directly to the preparation for Task 1 and use the material below only as needed. You may also Review Results for this Diagnostic in order to learn the items you missed and take it again as a quick way to learn the foundations. If you score lower than 70%, you should study the material below in a linear fashion.

**Linear Equations**

Watch the following " by MIT OpenCourseWare (from minute 1:00 to 21:30):

- **Lecture 1: The Geometry of Linear Equations**

Do the following:

- **1.1 Homework**

**Row Reductions**

Watch the following by MIT OpenCourseWare (first 19 minutes):

- **Lecture 2: Elimination with Matrices**

Do the following:

- **1.2 Homework**

**Vector Equations and the Equation Ax=b**
Watch the following by MIT OpenCourseWare (minutes 22:00 to 39:48):

- **Lecture 1: The Geometry of Linear Equations**

Do the following:

- **1.3 and 1.4 Homework**

**Matrices and Linear Transformations**

In this section, you will learn about linear transformations and how to represent linear transformations using matrix multiplication. Complete the following.

**Self-evaluation of Task 3 Readiness**

Set aside an hour or so to do the Task 3 Diagnostic, which has 18 items and covers the prerequisite knowledge for Task 3. If you score above 70%, you can probably skip straight to the Task activities below and use the other materials relating to Chapters 1 through 3 only as needed. You may also Review Results for this Diagnostic to learn the material you missed. If you score lower than 70%, you should study the material below in a linear fashion.

**Linear Transformations**

Watch the following by MIT OpenCourseWare (to 36:58):

- **Lecture 30: Linear transformations and their matrices**

Do the following:

- **1.8 Homework**

**The Matrix of a Linear Transformation**

Watch the following by Kahn Academy:

- **Linear transformation examples: scaling and reflections**

Do the following:

- **1.9 Homework**

**Create a Rotation Matrix (Task 3, Part A1)**

Examine the following:

- **Section 1.9, Example 3**

Imagine placing the tip of your pencil at the origin and rotating the xy-plane around it. Wherever you stop rotating, you will get a linear transformation of the plane. Because it is a linear transformation, this rotation can be represented by a matrix. If you happened to rotate the plane 360° (or 0°), then each point will end up in the same place it started, and the matrix would just
be the identity matrix I. In part A, you can choose any rotation other than those that give you the identity matrix.

**Create a Transformation Matrix (Task 3, Part D1)**

Examine the following:

- **Section 1.9, Theorem 10**

Please note the unit square has vertices at (0,0), e1 = (1,0), (1,1), and e2 = (0,1). Use the picture of the parallelogram to figure out where e1 and e2 go. There are two possible answers depending on your interpretation of which goes where.

**Matrix Operations**

Watch the following Khan Academy videos:

- [Introduction to the Matrix](#) (4:28)
- [Scalar Multiplication](#) (2:18)
- [Matrix Addition and Subtraction](#) (5:35)
- [Multiplying a Matrix by a Vector](#) (through 12:00)
- [Matrix Multiplication](#) (6:25)
- [Multiplying a Matrix by a Matrix](#) (5:30)

Do the following:

- **2.1 Homework**

**Apply a Rotation Matrix (Task 3, Part A2)**

Applying a rotation matrix to a vector means multiplying the matrix by the vector. Multiply the rotation matrix created in Part A1 by the vector given in the Task.

**The Inverse of a Matrix**

Watch the following Khan Academy videos:

- [Finding the determinant of a 2x2 matrix](#) (1:10)
- [Inverse of a 2x2 matrix](#) (2:47)

Do the following:

- **2.2 Homework**

**Create a Non-invertible Matrix (Task 3, Part B)**

For Parts B1 and B2, refer to [Theorem 4 in Section 2.2](#) and the paragraph following Theorem 4 to create a 2x2 matrix and demonstrate that it is not invertible.

For Part B3, you need to determine invertibility of a matrix with an unknown entry. Think about replacing one of the four numbers in your matrix with a variable. Explain how you could
determine the value of that variable from the other three entries in the matrix, using the fact that it is not invertible.

Find the Inverse (Task 3, Part C1 and C2)

Refer to Theorem 4 in Section 2.2 and the material just afterwards to use the determinant and the formula to demonstrate the given matrix is invertible.

Characterizations of Invertible Matrices

Watch the following YouTube video:

- Sec 2.3 Invertible Matrix Theorem

Do the following:

- 2.3 Homework

Demonstrate Invertibility (Task 3, Part C2)

Theorem 8 in Section 2.3 provides many possibilities for demonstrating invertibility of the matrix. Since all the statements are logically equivalent, if you can show any one of them is true for the given matrix, that means statement $a$ is also true, so you know it is invertible. The simplest statements to check are $b$, $c$, $d$, $e$, $h$, or $i$, so pick two different options and confirm the given matrix satisfies them (however, some of these options will require learning about vector spaces in Chapter 4).

Determinants

Watch the following Khan Academy video (20:09):

- Determinant as a scaling factor

Do the following:

- 3.1/3.2/3.3 Homework

Describe Relationships between Determinant and Area (Task 3, Part D2)

Examine the following to understand the general relationship between determinants and areas:

- Section 3.3, Theorems 9 and 10

In the Task, "showing all work" actually means explaining the more general relationship in the context of the specific example. Please do not just compute the determinant, find the area of the figure, and say 'they are equal' or 'their absolute values are equal.' You must discuss the relationship between the area of the original unit square and the parallelogram.

Write about the general relationship that would predict the area of any shape, no matter what area it had before being transformed. The relationship involves the area of the original figure,
the area of the transformed figure, and the determinant of the matrix that represents the transformation.

Submit Task 3

When you have completed all parts of this section, you may submit Task 3 to TaskStream. If you do not pass the Task, meet with your Course Instructor.

Vector Spaces and Subspaces

In this section, you will learn about vector spaces and subspaces. A vector space is a set of elements (the ‘vectors’) which can be added or multiplied by real numbers (the ‘scalars’). The formal definition of a vector space involves a set of axioms which the vector space must satisfy. A ‘subspace’ of a vector space is a subset of the vectors which forms a vector space itself. Complete the following.

Vector Spaces

Read ONE of the following:

- WikiBooks "Linear Algebra/Definition and Examples of Vector Spaces"
- Section 4.1 up through Example 5 & Figure 5

Do the following:

- **4.1A Homework**

Proving Something Is a Vector Space

Proof of $\mathbb{R}^2$ being a vector space is about 'proving the obvious.' Of course vectors in $\mathbb{R}^2$ have all ten properties, because the real numbers do. However, that falls far short of the necessary rigor for writing proofs in a Linear Algebra course. When writing rigorous proofs, you need to ensure the following:

- **Do the smallest possible algebraic step each time, with full justification of that step.**
- **Invoke the properties of vector addition and scalar multiplication** in order to combine the coordinates. Through one or several steps, you will end up with a single vector.
- **Keep and/or create parentheses when you're doing scalar multiplication or vector addition** with more than one symbol. As you write your verifications, give a high degree of detail.
- Since the coordinates of the resulting single vector are each made up of regular real numbers with regular real number operations, you should **invoke the properties of real number arithmetic** to change around the symbols (commute or associate or distribute, for example). Your proof must include an explicit reference to a property of real numbers—if your work doesn't use real number properties in one of the steps, you should take that as an indication that you haven't done things correctly. Additionally, the real number property should match the vector property you are trying to prove.
- **Use the properties of vector addition and scalar multiplication** again to translate the
reorganized coordinates into their new vector form.

**Using Properties in Proofs**

Proofs for two Axioms are provided below to model the degree of precision and detail you should have in your Task. There are two types of justifications that can be used in your proofs.

One type of justification is to cite a vector property. These properties are as follows:

- substitution of coordinate form for vector form
- substitution of vector form for coordinate form
- vector addition of coordinate form
- scalar multiplication of coordinate form

Another type of justification is to cite a real number property. These properties are as follows:

- real number associativity of addition or multiplication
- real number commutativity of addition or multiplication
- closure of real number addition or multiplication
- distributive property of real number multiplication over real number addition
- identity property of real number addition or multiplication
- inverse property of real number addition or multiplication

**Proof of Axiom 1: X+Y is in R2 for X and Y in R2**

*Please note: The first two algebraic steps in this proof are vector property steps. The next two deductions come from real number properties. Be aware that you must cite the correct type of property for the proofs in the task.*

1. Let vectors X and Y in R² be represented by X = \((x_1, x_2)\) and Y = \((y_1, y_2)\) where \(x_1, x_2, y_1,\) and \(y_2\) are real numbers because all the coordinates have to be real for the vectors to be in R².
2. \(X + Y = (x_1, x_2) + (y_1, y_2)\) by substituting coordinate form of vectors
3. \(= (x_1 + y_1, x_2 + y_2)\) by the definition of vector addition.
4. Since \(x_1\) and \(y_1\) are real numbers, their sum is a real number because of the closure of addition of real numbers. Therefore, the first coordinate of that vector is real.
5. Since \(x_2\) and \(y_2\) are real numbers, their sum is a real number because of the closure of addition of real numbers. Therefore, the second coordinate of that vector is real.
6. Thus, both coordinates are real numbers, so that vector, which is \(X + Y\), is in R².

**Proof of Axiom 2: (X+Y)+Z = X+(Y+Z) for X, Y, and Z in R2**

*Please note: The first three algebraic steps in this proof are vector property steps. The step in the middle of the algebraic work is justified by a real number property. The final three algebraic steps are vector property steps. Be aware that you must cite the correct type of property for the proofs in the task, and most of them follow this kind of symmetry of steps involving properties of vectors, then reals, then vectors again.*

1. Let vectors X, Y, and Z in R² be represented by:
2. \( X = (x_1, x_2), Y = (y_1, y_2), \) and \( Z = (z_1, z_2) \) where \( x_1, x_2, y_1, y_2, z_1, \) and \( z_2 \) are real numbers.

3. \( (X + Y) + Z = ((x_1, x_2) + (y_1, y_2)) + (z_1, z_2) \) by substituting coordinate form of vectors

4. \( = (x_1 + y_1, x_2 + y_2) + (z_1, z_2) \) by the definition of vector addition

5. \( = ((x_1 + y_1) + z_1, (x_2 + y_2) + z_2) \) by the definition of vector addition

6. \( = (x_1 + (y_1 + z_1), x_2 + (y_2 + z_2)) \) by the associativity of addition of real numbers

7. \( = (x_1, x_2) + (y_1 + z_1, y_2 + z_2) \) by the definition of vector addition

8. \( = ((x_1, x_2) + ((y_1, y_2) + (z_1, z_2)) \) by the definition of vector addition

9. \( = X + (Y + Z) \) by substituting vector form of coordinates

10. Since \( (X + Y) + Z = X + (Y + Z) \) by the string of equalities above, then vector addition is associative and the rule is proven true for \( \mathbb{R}^2 \).

**Proving Other Axioms (Task 4, Part A)**

In Task 4 you will prove axioms 3 through 10. The level of detail required is similar to the proofs given above.

Axiom 6 will follow a similar setup as Axiom 1.

The proofs of axioms 3, 4, 5, 7, 8, 9, and 10 will follow a similar setup as Axiom 2. Use the procedure below as a general guide.

Procedure:

1. Start by using substitution of coordinate form.
2. As needed, use the definition of vector addition and/or scalar multiplication.
3. Use a real number property that matches the vector property you are trying to prove. The real number properties are listed above under "Using Properties in Proofs."
4. "Work backwards" using the definition of vector addition and/or scalar multiplication.
5. Substitute the vector form to complete the proof.

Be sure to pay careful attention to the parentheses and commas. Don’t confuse the parentheses of a vector \( (x_1, x_2) \) with those associated with a real property, such as \( ((r+s)x_1, (r+s)x_2). \)

**Subspaces**

Read ONE of the following:

- Pages 3–6 of Vector Spaces & Subspaces (starting on page 3)
- Section 4.1 from after Example 5 through Example 9

Do the following:

- **4.1B Homework**

**Example of a Subspace (Task 4, Part A2)**

In advanced mathematics, you will not be successful if you do not understand the definitions of
important terms. It is necessary to know what "subspace" means and what "non-trivial" means. We'll address them in reverse order, but for the Task, it is probably wiser to prove your set is a subspace first, then discuss why it is non-trivial second.

Your work for Part A2 should have six parts:

- a description of your subspace as a set
- proof that the zero vector is an element
- proof of closure under vector addition
- proof of closure under scalar multiplication
- an example of an element of your subspace that is not the zero vector
- an example of an element of $\mathbb{R}^2$ that is not in your subspace

Subspace Proof

As you have learned, there are three short rules a set must fulfill in order to be a subspace (includes zero vector, closed under vector addition, closed under scalar multiplication). That means you will have to give your example as a subset of $\mathbb{R}^2$. You cannot define it geometrically, because the rules are defined in terms of set inclusion. You must define it as a set. Your intuitive understanding of the example is likely geometric, but you must convert your geometric intuition into an algebraic set description and justify the three rules algebraically. In a Linear Algebra course, discussion, justification, and proof need to be algebraic in nature; it is only in a Geometry course that you need only give geometric arguments. To help you transition from informal to formal arguments, watch this video on YouTube.

Please note two counterexamples that many students are confused about:

- A finite list of points never works as a subspace.
- Something "curvy" never works as a subspace.

For additional discussion of these two counterexamples, see this Course Knowledgebase article. The methods used to show that these are NOT subspaces might give you some inspiration on what set you decide to use as your subspace and how you should prove the three rules for being a subspace are fulfilled.

Non-trivial Proof

The definition of "non-trivial" is actually a bit of math terminology that is used across many courses—it translates roughly as "interesting." The idea is that something "trivial" is barely worth noticing. For example, EVERY matrix equation $Ax = 0$ has the solution $x = 0$ no matter what the matrix $A$ is, so $x = 0$ is called the trivial solution. In Set Theory, the whole set $S$ and the empty set $\emptyset$ are ALWAYS subsets of the original set $S$, no matter what the original set $S$ is. For subspaces, there is a similar situation, as described in the following quote from your textbook:

"Note that $\mathbb{R}^n$ is a subspace of itself because it has the three properties required for a subspace...The set consisting of only the zero vector in $\mathbb{R}^n$...also satisfies the conditions for a subspace."
This means the non-trivial subspace of $\mathbb{R}^2$ that you create for the Task cannot be the zero vector (zero-dimensional) nor the whole space $\mathbb{R}^2$ (two-dimensional). Make sure you explain why your chosen subspace is not just the zero vector and why it is not all of $\mathbb{R}^2$.

Submit Task 4

When you have completed all parts of this section, you may submit Task 4 to TaskStream. If you don't pass the Task, meet with your Course Instructor.

Final Steps

Congratulations on completing the activities in this course! This course has prepared you to complete the assessment associated with this course. If you have not already been directed to complete the assessment, schedule and complete your assessment now.