

Math 207 Section A, Quiz 6

Name: Answer key

No credit for answers unaccompanied by a clear justification. You must show your work!

Cheating will not be tolerated. If there is any indication that a student may have given or received unauthorized aid on this test, the case will be handed over immediately to the ISU Office of Judicial Affairs.

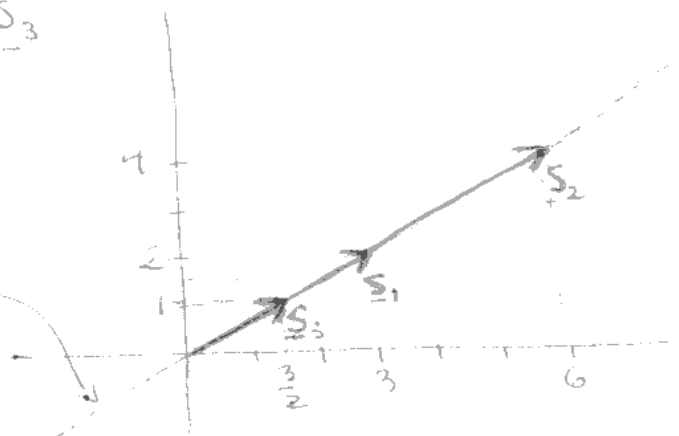
1. (6 points) Determine whether the set S spans \mathbb{R}^2 . If the set does not span \mathbb{R}^2 , then give a geometric description of the subspace that it does span.

$$S = \{(3, 2), (6, 4), (\frac{3}{2}, 1)\} = \{\underline{s}_1, \underline{s}_2, \underline{s}_3\}.$$

Show your work here:

The set does not span \mathbb{R}^2 since these three vectors are scalar multiples of one another, so they all lie on the same line; ~~and~~ more precisely, $2\underline{s}_1 = \underline{s}_2 = 4\underline{s}_3$

(the subspace of \mathbb{R}^2 spanned by S is the line $y = \frac{2}{3}x$.)



Answer here: (fill in the circle next to the correct answer)

- ☐ S spans \mathbb{R}^2
- ☐ S spans a point in \mathbb{R}^2
- ☒ S spans a line in \mathbb{R}^2
- ☐ S spans a plane in \mathbb{R}^2

2. (6 points) Consider the following set of vectors in R^2

$$S = \{s_1, s_2, s_3\} = \{(3, 2), (1, 1), (2, 0)\}.$$

Show that S is linearly dependent by writing s_1 as a linear combination of s_2 and s_3 .

Show your work here:

We want to find a and b such that

$$a s_2 + b s_3 = s_1 \quad \text{i.e.} \quad a \begin{pmatrix} 1 \\ 1 \end{pmatrix} + b \begin{pmatrix} 2 \\ 0 \end{pmatrix} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

So form $\left(\begin{array}{cc|c} 1 & 2 & 3 \\ 1 & 0 & 2 \end{array} \right)$ and reduce.

$$\begin{array}{l} \text{Swap} \\ \text{rows} \end{array} \rightarrow \left(\begin{array}{cc|c} 1 & 0 & 2 \\ 1 & 2 & 3 \end{array} \right) \xrightarrow{R_2 - R_1 \rightarrow R_2} \left(\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 2 & 1 \end{array} \right) \xrightarrow{\frac{1}{2} R_2 \rightarrow R_2} \left(\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & 1/2 \end{array} \right)$$

$$\therefore \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} 2 \\ 1/2 \end{pmatrix}$$

$$\text{So } \underline{a=2} \quad \underline{b=1/2}$$

Answer here:

$$s_1 = 2 s_2 + \left(\frac{1}{2} \right) s_3$$

3. (6 points) For the set S in Question 2, say whether each statement below is true or false. Write your answer on the line provided.

(a) The set S is a basis for R^2

FALSE

(b) The vectors in S span R^2

TRUE

(c) The vectors in S span R^3

FALSE

When you finish the test, acknowledge that you understand the cheating policy by signing the following pledge:

"On my honor as a student I, _____, have neither given nor received unauthorized aid on this test." (Print Name)

Signature: _____ Date: _____