SIT292 Module 1 Self-Assessment

Click on a question number to see how your answers were marked and, where available, full solutions.

Question Number	Score
Question 1	1 / 1
Question 2	1 / 1
Question 3	1 / 4
Question 4	2 / 2
Question 5	0 / 2
Total	**5 / 10 (50%)**

Unfortunately you have not achieved the minimum score.

If you have tried this test several times and have not been able to pass, then it is strongly advised that you attend class to go over your results with the teaching team. You can attempt the quiz while in class, and discuss your results with the tutors. Do *not* attempt to try to solve this quiz on your own without understanding your mistakes first. You will likely end up spending far more time than necessary on the module.

You should still use the "Print this results summary" option to save a copy of your results as a pdf, which will help with your learning and can also be shared with your tutors so they can help with certain questions.

Performance Summary

Exam Name:	SIT292 Module 1 Self-Assessment
Session ID:	16583255477
Exam Start:	Sun Jul 21 2024 22:38:40
Exam Stop:	Sun Jul 21 2024 23:36:40
Time Spent:	0:57:59

Question 1

Consider the following system of linear equations.

$$\begin{aligned} 3x_1 - x_2 - 4x_3 &= -10 \\ -5x_2 &= -15 \\ -3x_1 + 3x_3 &= 9 \\ -3x_2 - 3x_3 &= -3 \end{aligned}$$

Provide the **augmented matrix** of the system. Use the up and down arrows next to the row/column numbers to increase the size of your matrix.

Rows: 4 Columns: 4

$$\begin{pmatrix} 3 & -1 & -4 & -10 \\ 0 & -5 & 0 & -15 \\ -3 & 0 & 3 & 9 \\ 0 & -3 & -3 & -3 \end{pmatrix}$$ ✔

Expected answer: $$\begin{pmatrix} 3 & -1 & -4 & -10 \\ 0 & -5 & 0 & -15 \\ -3 & 0 & 3 & 9 \\ 0 & -3 & -3 & -3 \end{pmatrix}$$

Your answer is correct. You were awarded **1** mark. ✔

You scored **1** mark for this part.

Score: 1/1 ✔

Question 2

For the following (non-homogeneous) system represented by its augmented matrix,

$$\begin{pmatrix} 0 & 5 & 10 \\ -6 & 0 & -24 \\ 7 & 1 & 30 \\ 0 & 4 & 8 \end{pmatrix}$$

Which of the following are solutions?

- [ ] $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$
- [x] $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$
- [ ] $\begin{pmatrix} 0 \\ -4 \\ -1 \end{pmatrix}$
- [ ] $\begin{pmatrix} 3 \\ 2 \\ 5 \end{pmatrix}$

Expected answer:

- [ ] $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$
- [x] $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$
- [ ] $\begin{pmatrix} 0 \\ -4 \\ -1 \end{pmatrix}$
- [ ] $\begin{pmatrix} 3 \\ 2 \\ 5 \end{pmatrix}$

✔

You chose a correct answer. You were awarded **1** mark. ✔

You scored **1** mark for this part.

Score: 1/1 ✔

Question 3

Use the Gaussian Algorithm and complete the steps below to solve the following for $\mathbf{x}$.

$$\begin{pmatrix} -2 & -4 & 5 & 6 \\ 3 & 6 & -6 & 0 \\ 1 & 2 & -1 & 1 \\ 0 & 0 & 1 & 2 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -14 \\ 9 \\ 0 \\ -4 \end{pmatrix}$$

Enter the augmented matrix that results after following steps 1-4 of the Gaussian Algorithm in structions (p11 of 1.2 in the textbook). You should have a leading 1 in the first row and all entries below it equal to 0.

$$\begin{pmatrix} 1 & 2 & -1 & 1 & 0 \\ 0 & 0 & 3 & 8 & -14 \\ 0 & 0 & -3 & -3 & 9 \\ 0 & 0 & 1 & 2 & -4 \end{pmatrix}$$ ✔

Expected answer: $$\begin{pmatrix} 1 & 2 & -1 & 1 & 0 \\ 0 & 0 & 3 & 8 & -14 \\ 0 & 0 & -3 & -3 & 9 \\ 0 & 0 & 1 & 2 & -4 \end{pmatrix}$$

Continue the steps on the next available column and enter the resulting matrix below (remember there should be a leading 1 in the second row with all entries below it equal to 0).

$$\begin{pmatrix} 1 & 2 & -5/2 & -3 & 7 \\ 0 & 0 & -1 & 7 & -8 \\ 0 & 0 & 0 & 1 & -20/15 \\ 0 & 0 & 0 & 1 & -2/5 \end{pmatrix}$$ ✖

Expected answer: $$\begin{pmatrix} 1 & 2 & -1 & 1 & 0 \\ 0 & 0 & 1 & 2 & -4 \\ 0 & 0 & 0 & 2 & -2 \\ 0 & 0 & 0 & 3 & -3 \end{pmatrix}$$

Enter the final row-echelon augmented matrix

$$\begin{pmatrix} \_\_\_ & \_\_\_ & \_\_\_ & \_\_\_ & \_\_\_ \\ \_\_\_ & \_\_\_ & \_\_\_ & \_\_\_ & \_\_\_ \\ \_\_\_ & \_\_\_ & \_\_\_ & \_\_\_ & \_\_\_ \\ \_\_\_ & \_\_\_ & \_\_\_ & \_\_\_ & \_\_\_ \end{pmatrix}$$ ✖

Expected answer: $$\begin{pmatrix} 1 & 2 & -1 & 1 & 0 \\ 0 & 0 & 1 & 2 & -4 \\ 0 & 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Now use this matrix to find a vector $\mathbf{x}$ that solves the system. If you have a free variable, set it to zero (e.g., if x_3 is a free variable, then let $x_3 = 0$, and determine the remaining values based on that.

$$\mathbf{x} = \begin{pmatrix} \_\_\_ \\ \_\_\_ \\ \_\_\_ \\ \_\_\_ \end{pmatrix}$$

Expected answer: $$\begin{pmatrix} -1 \\ 0 \\ -2 \\ -1 \end{pmatrix}$$

Gap 0

This step appears correct. The matrix is in the correct form and values are correct. You were awarded **1** mark. ✔

Gap 1

This step is incorrect. Either the matrix is in the incorrect form or values are incorrect. ✖

Gap 2

One or more of the cells in your answer is empty. ❗

Score: 1/4 ✔

Question 4

Consider the following solution vectors for a given homogenous system of linear equations,

$$\mathbf{x}_1 = \begin{pmatrix} 5 \\ -8 \\ -11 \end{pmatrix}, \mathbf{x}_2 = \begin{pmatrix} 0 \\ 5 \\ 5 \end{pmatrix}, \mathbf{x}_3 = \begin{pmatrix} -5 \\ 3 \\ 6 \end{pmatrix}$$

If it is possible, express the vector $\mathbf{v} = \begin{pmatrix} 5 \\ -18 \\ -21 \end{pmatrix}$ as a linear combination of $\mathbf{x}_1, \mathbf{x}_2$ and $\mathbf{x}_3$.

$\mathbf{v} =$ 1 Expected answer: 1 $\begin{pmatrix} 5 \\ -8 \\ -11 \end{pmatrix}$ +

-2 Expected answer: -2 $\begin{pmatrix} 0 \\ 5 \\ 5 \end{pmatrix}$ +

0 Expected answer: 0 $\begin{pmatrix} -5 \\ 3 \\ 6 \end{pmatrix}$

If it is not possible, enter 0 for all 3 coefficients.

Correct. Your coefficients will result in a linear combination that produces the vector, V. You were awarded **2** marks.

You scored **2** marks for this part.

Score: 2/2

Question 5

Consider the system of equations,

$$\begin{aligned} 2x + y - z &= k \\ -4x + (-3k-5)\,y + (2k+2)\,z &= -1 \\ -2x - y + \left(k^2 + 5k + 5\right) z &= 4 \end{aligned}$$

where $x, y, z \in \mathbb{R}$ are variables and $k \in \mathbb{R}$ is fixed.

(a) Determine the values of k for the following solution cases:

i. The value of k for which the system has **no solutions** is $k =$

1 ✖ Expected answer: -1

ii. The value of k for which the system has **multiple solutions** is $k =$

0 ✖ Expected answer: -4

(b) Find all solutions to the system in case (ii) above. Express these in the form $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \mathbf{b} + a\mathbf{v}$ where $\mathbf{v}$ and $\mathbf{b}$ are vectors and $a \in \mathbb{R}$.

$\begin{pmatrix} x \\ y \\ z \end{pmatrix}$ = $\begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$ ✖ Expected answer: $\begin{pmatrix} -3/2 \\ -1 \\ 0 \end{pmatrix}$ $+ a$

$\begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$ ✖ Expected answer: $\begin{pmatrix} 1/18 \\ 8/9 \\ 1 \end{pmatrix}$

...

For example, if your solution is $x = 3, y = 2 + 3a, z = a$, then this would be expressed $\begin{pmatrix} 3 \\ 2 \\ 0 \end{pmatrix} + a \begin{pmatrix} 0 \\ 3 \\ 1 \end{pmatrix}$

Gap 0

Your answer is incorrect. ✖

Gap 1

Your answer is incorrect. ✖

Gap 2

This vector should be a solution when k = -4. ✖

Gap 3

This vector will not be a solution for all values of a. ✖

You scored **0** marks for this part.

Score: 0/2 ✖

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