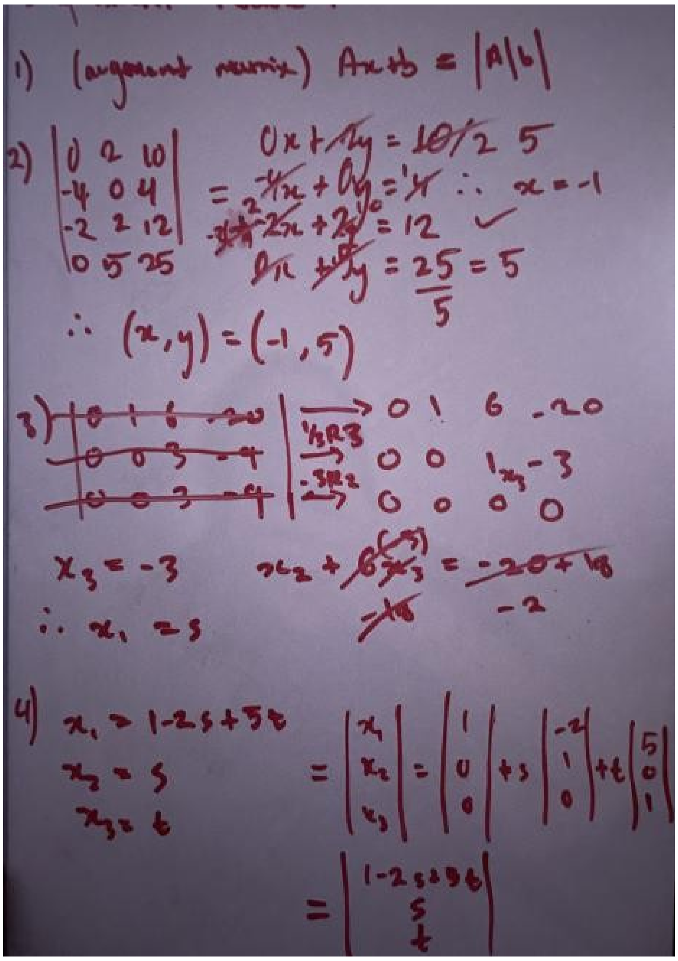
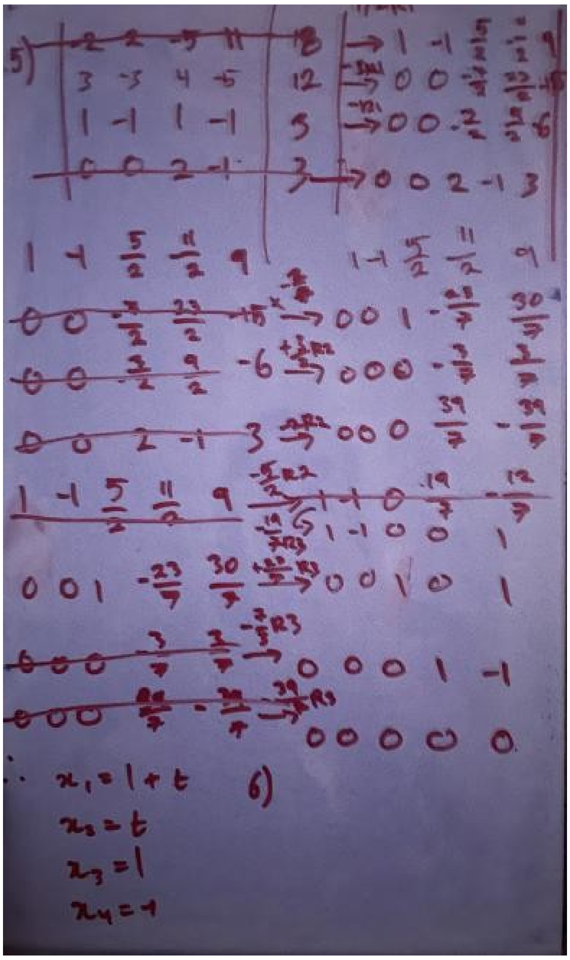
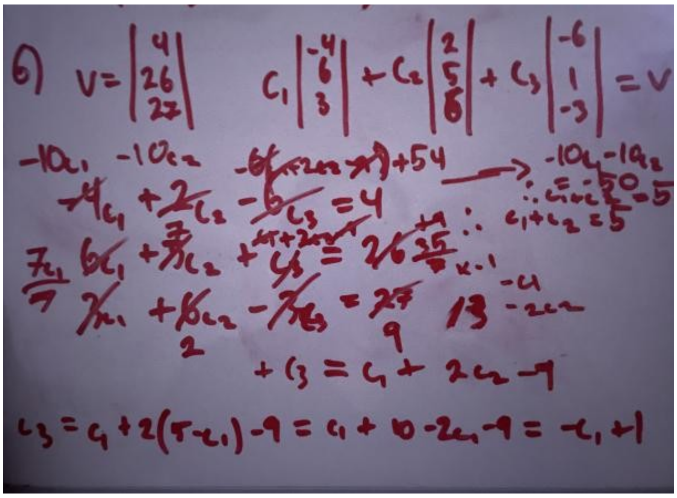
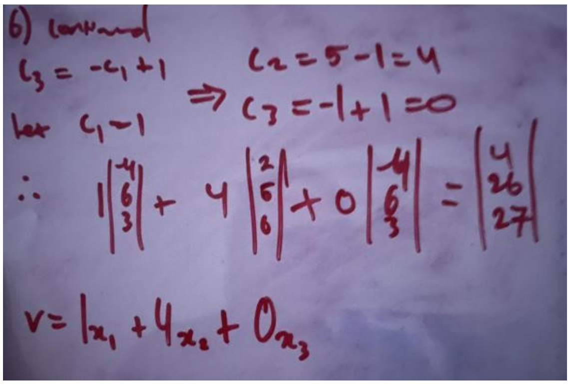
Self Assessment – Jacob Booth 221530207









Being the first timed assessment I went in a little stressed, but I can see for next time that the best approach is to stay calm and determine my approach carefully, don't jump into anything without thinking each problem through completely. Question 5 was definitely the longest to document all my steps, and my question 6 attempt could have been more graceful had I gone straight into Gaussian Elimination (discussed in Learning Evidence). The key takeaway is to stay calm, be confident in my abilities, and don't over complicate anything. I used my scientific calculator app for crunching fraction arithmetic and a few other less obvious cell operations to ensure I didn't mess up at the most fundamental level.

Calculator Infinity: https://apps.apple.com/au/app/calculator/id458535809

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	Review
Question 1	1/1	
Question 2	1/1	
Question 3	4/4	
Question 4	3/3	
Question 5	4/4	
Question 6	2/2	
Total	15/15	(100%)

Congratulations! You have achieved the minimum threshold for this module's self-assessment.

Use the "Print this results summary" and save your attempt as a pdf. You will need the printout showing all questions for your module submission.

Performance Summary

Exam Name:	SIT292 Module 1 Self-Assessment
Session ID:	513032831522922
Exam Start:	Sun Jul 13 2025 10:39:38
Exam Stop:	Sun Jul 13 2025 11:45:54
Time Spent:	0:12:20

Question 1

Consider the following system of linear equations.

$$\begin{aligned} 8x_1 &= 40 \\ 8x_2 &= 40 \\ 4x_1 - 2x_2 &= 10 \\ -5x_1 &= -25 \end{aligned}$$

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: 3

$$\begin{pmatrix} 8 & 0 & 40 \\ 0 & 8 & 40 \\ 4 & -2 & 10 \\ -5 & 0 & -25 \end{pmatrix}$$

✔

Expected answer: $\begin{pmatrix} 8 & 0 & 40 \\ 0 & 8 & 40 \\ 4 & -2 & 10 \\ -5 & 0 & -25 \end{pmatrix}$

Score: 1/1 ✔

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

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

Question 2

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

$$\begin{pmatrix} 0 & 2 & 10 \\ -4 & 0 & 4 \\ -2 & 2 & 12 \\ 0 & 5 & 25 \end{pmatrix}$$

Which of the following are solutions?

- [ ] $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$
- [x] $\begin{pmatrix} -1 \\ 5 \end{pmatrix}$
- [ ] $\begin{pmatrix} 2 \\ -2 \\ -4 \end{pmatrix}$
- [ ] $\begin{pmatrix} -2 \\ 5 \\ 5 \end{pmatrix}$

Expected answer:

- [ ] $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$
- [x] $\begin{pmatrix} -1 \\ 5 \end{pmatrix}$
- [ ] $\begin{pmatrix} 2 \\ -2 \\ -4 \end{pmatrix}$
- [ ] $\begin{pmatrix} -2 \\ 5 \\ 5 \end{pmatrix}$

✔

Score: 1/1 ✔

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

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

Question 3

Consider the following matrix representing the augmented form [A|**b**] of a system of 3 linear equations:

$$\begin{pmatrix} 0 & -3 & -18 & 60 \\ 0 & -2 & -9 & 31 \\ 0 & -3 & -15 & 51 \end{pmatrix}$$

Row operations

After applying the first sets of Gaussian algorithm steps, the following matrix is obtained:

$$\begin{pmatrix} 0 & 1 & 6 & -20 \\ 0 & 0 & 3 & -9 \\ 0 & 0 & 3 & -9 \end{pmatrix}$$

Use division/multiplication by a scalar first to create a leading 1 in row 2, and then use the new Row 2 to make the value below its leading 1 a zero.

Enter the resulting matrix, which should be in row echelon form.

$$\begin{pmatrix} 0 & 1 & 6 & -20 \\ 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$ ✔

Expected answer: $$\begin{pmatrix} 0 & 1 & 6 & -20 \\ 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

Score: 1/1 ✔

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Solve the system

Based on the augmented form you've obtained, solve the system in terms of the free variable, which you can denote by s.

Enter your equations in terms of s

x1 = s s ✔ Expected answer: s s

x2 = -2 -2 ✔ Expected answer: -2 -2

x3 = -3 -3 ✔ Expected answer: -3 -3

Score: 3/3 ✔

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Question 4

On the left-hand side below we have the original equations (in augmented form [A | **b**] and then the row echelon form on the right.

$$\begin{pmatrix} 3 & 6 & -15 & 3 \\ -3 & -6 & 15 & -3 \\ -4 & -8 & 20 & -4 \end{pmatrix} \to \begin{pmatrix} 1 & 2 & -5 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

The set of solutions, in terms of the parameters s and t, is:

$x_1 = 1 - 2s + 5t$

$x_2 = s$

$x_3 = t$

Express this as the addition of three vectors, a constant vector and two vectors which are multiplied by s and t.

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$ ✔ Expected answer: $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ $+s$

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

$$\begin{pmatrix} 5 \\ 0 \\ 1 \end{pmatrix}$$ ✔ Expected answer: $\begin{pmatrix} 5 \\ 0 \\ 1 \end{pmatrix}$

Score: 3/3 ✔

constant

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

coeff of s

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

coeff of t

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

You scored **3** marks for this part.

Question 5

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

$$\begin{pmatrix} -2 & 2 & -5 & 11 \\ 3 & -3 & 4 & -5 \\ 1 & -1 & 1 & -1 \\ 0 & 0 & 2 & -1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -18 \\ 12 \\ 3 \\ 3 \end{pmatrix}$$

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.

$$\begin{pmatrix} 1 & -1 & 5/2 & -11/2 & 9 \\ 0 & 0 & -7/2 & 23/2 & -15 \\ 0 & 0 & -3/2 & 9/2 & -6 \\ 0 & 0 & 2 & -1 & 3 \end{pmatrix}$$ ✔

Expected answer: $$\begin{pmatrix} 1 & -1 & 1 & -1 & 3 \\ 0 & 0 & -3 & 9 & -12 \\ 0 & 0 & 1 & -2 & 3 \\ 0 & 0 & 2 & -1 & 3 \end{pmatrix}$$

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).

$$\begin{pmatrix} 1 & -1 & 5/2 & -11/2 & 9 \\ 0 & 0 & 1 & -23/7 & 30/7 \\ 0 & 0 & 0 & -3/7 & 3/7 \\ 0 & 0 & 0 & 39/7 & -39/7 \end{pmatrix}$$ ✔

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

Enter the final row-echelon augmented matrix

$$\begin{pmatrix} 1 & -1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$ ✔

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

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.

$$\mathbf{x} = \begin{pmatrix} \boxed{1} \\ \boxed{0} \\ \boxed{1} \\ \boxed{-1} \end{pmatrix}$$

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

Score: 4/4 ✔

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

Gap 2

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

✔ You were awarded **1** mark.

You scored **4** marks for this part.

Question 6

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

$$\mathbf{x}_1 = \begin{pmatrix} -4 \\ 6 \\ 3 \end{pmatrix}, \mathbf{x}_2 = \begin{pmatrix} 2 \\ 5 \\ 6 \end{pmatrix}, \mathbf{x}_3 = \begin{pmatrix} -6 \\ 1 \\ -3 \end{pmatrix}$$

If it is possible, express the vector $\mathbf{v} = \begin{pmatrix} 4 \\ 26 \\ 27 \end{pmatrix}$ as a linear combination of $\mathbf{x}_1, \mathbf{x}_2$ and $\mathbf{x}_3$.

$\mathbf{v} =$ 1 Expected answer: 1 $\begin{pmatrix} -4 \\ 6 \\ 3 \end{pmatrix}$ +

4 Expected answer: 4 $\begin{pmatrix} 2 \\ 5 \\ 6 \end{pmatrix}$ +

0 Expected answer: 0 $\begin{pmatrix} -6 \\ 1 \\ -3 \end{pmatrix}$

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

Score: 2/2 ✔

✔ 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.

Created using Numbas (https://www.numbas.org.uk), developed by Newcastle University (https://www.newcastle.ac.uk).