MATRIX GROUPS

(MTH565)

Quiz 1

Monday, 19th August 2025

Name: _____

Roll Number: _____

Obtained Marks: _____ **/10**

EXAMINATION INSTRUCTIONS

1. This is a **Closed Book Examination**.
2. Answer all questions in the space provided on subsequent pages.
3. Show all necessary working steps clearly and legibly.
4. State any theorems or results used. Only results discussed in lectures may be used without proof.
5. **Duration:** 15 minutes.

Good Luck!

Problem Set

Problem 1

Let us consider ordered bases of $\mathbb{R}^3$ as follows:

$$\mathcal{B} = \{(1,0,0),(3,3,3),(0,2,0)\}, \quad \mathcal{C} = \{(1,1,0),(0,0,1),(0,1,1)\}.$$

(i) Write the coordinates of vector $\mathbf{v} = (2,-1,3)$ with respect to basis $\mathcal{B}$.

(ii) Let $P_{\mathcal{C}\leftarrow\mathcal{B}}$ denote the change of basis matrix from $\mathcal{B}$ to $\mathcal{C}$. Determine the matrix $P_{\mathcal{C}\leftarrow\mathcal{B}}$.

(iii) Hence, or otherwise, determine $P_{\mathcal{B}\leftarrow\mathcal{C}}$.

(iv) What is the relationship between $P_{\mathcal{B}\leftarrow\mathcal{C}}$ and $P_{\mathcal{C}\leftarrow\mathcal{B}}$?

(v) Calculate $P_{\mathcal{B}\leftarrow\mathcal{C}} \begin{bmatrix} 2 \\ 6 \\ -3 \end{bmatrix}$.

SOLUTION SPACE

Write your solution from the next page.

Begin Your Solution

Solution (continued)