

**Group A.****Ex. 1** Let  $u = -1 + i$  and  $w = 1 + i$  be two complex numbers.

- a) Draw the two numbers in the coordinate system. (0.5 points)
- b) Express  $u$  and  $w$  in the trigonometric form. (1 point)
- c) Calculate  $\frac{u}{w}$  using the trigonometric form. Simplify your result as much as possible. (1.5 points)

**Ex. 2**

a) Multiply matrices:  $\begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 4 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$  (2 points)

- b) Show an example of two matrices that cannot be multiplied. (1 point)

**Ex. 3**

a) Calculate the inverse of matrix  $\begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix}$  using any method you wish... (1 point)

b) ... and then find matrix  $X$  such that  $X \cdot \begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 4 & 2 \end{bmatrix}$ . (2 points)

**Ex. 4** Solve the following system of equations using Gaussian elimination or the Cramer formula. You may not

use any other method. 
$$\begin{cases} x - 2y - 3z = -7 \\ y + 4z = 5 \\ z = 18 \end{cases} \quad (3 \text{ points})$$

**Ex. 5** List three properties of a determinant regarding its rows. (3 points)**Group B.****Ex. 1** Let  $u = 1 + i$  and  $w = -1 + i$  be two complex numbers.

- a) Draw the two numbers in the coordinate system. (0.5 points)
- b) Express  $u$  and  $w$  in the trigonometric form. (1 point)
- c) Calculate  $u \cdot w$  using the trigonometric form. Simplify your result as much as possible. (1.5 points)

**Ex. 2**

a) Multiply matrices:  $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \cdot \begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 4 \end{bmatrix}$  (2 points)

- b) Show an example of two matrices that cannot be multiplied. (1 point)

**Ex. 3**

a) Calculate the inverse of matrix  $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$  using any method you wish... (1 point)

b) ... and then find matrix X such that  $X \cdot \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix}$ . (2 points)

**Ex. 4** Solve the following system of equations using Gaussian elimination or the Cramer formula. You may not

use any other method. 
$$\begin{cases} x + y + z = 4 \\ -3y + 5z = -5 \\ -z = 2 \end{cases} \quad (3 \text{ points})$$

**Ex. 5** List three properties of a determinant regarding its columns. (3 points)