

Quiz 1

Math 341

Name: KEY

Show *all* your work (algebraically or geometrically) for each and simplify. No credit is given without supporting work.

1. [1] Find a_x and b^y so that $\frac{3+6i}{2+i} = a + bi$.
where a and b are real numbers.

$$\frac{3+6i}{2+i} \cdot \frac{2-i}{2-i} = \frac{(3+6i)(2-i)}{4 - 2i + 2i - i^2} = \frac{6 - 3i + 12i - 6i^2}{4 - i^2} = \frac{12 + 9i}{5} = \frac{12}{5} + \frac{9}{5}i$$

$a = 12/5$ $b = 9/5$

right

$$\overline{(2+i)} = (2-i)$$

2. [4] The following were the result of applying the Gauss-Jordan elimination to the augmented matrix of a linear system. *Carefully* write out the general solutions to each system below or indicate that it is inconsistent.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 \end{array} \right]$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 \end{array} \right]$$

$$\{(x_1, x_2, x_3) \mid x_1 = 0, x_3 = 2, x_2 \in \mathbb{R}\}$$

~~$$\{(x_1, x_2, x_3) \mid x_1 = 1, x_2 = 2\}$$~~

$$\{(0, x_2, 2) \mid x_2 \in \mathbb{R}\}$$

inconsistent

last row

$$\Rightarrow 0 = 1 \quad \text{✗}$$

3. [5] Find the solution set to the following system of linear equations by using elementary row operations on the associated augmented matrix. Verify that the solutions you find are actually solutions.

$$\begin{aligned} x_1 + x_2 &= -2 \\ 5x_1 + 2x_2 &= 5 \\ x_1 + 2x_2 &= -7 \end{aligned}$$

$$\left[\begin{array}{cc|c} 1 & 1 & -2 \\ 5 & 2 & 5 \\ 1 & 2 & -7 \end{array} \right] \begin{array}{l} R_2 - 5R_1 = 1R_2 \\ R_3 - R_1 = 1R_3 \end{array} \rightarrow \left[\begin{array}{cc|c} 1 & 1 & -2 \\ 0 & -3 & 15 \\ 0 & 1 & -5 \end{array} \right]$$

$$\begin{aligned} 2 - 5(-2) &= -3 \\ 5 - 5(-2) &= 5 + 10 = 15 \\ -7 + 2 &= -5 \end{aligned}$$

$$\xrightarrow{\frac{1}{3}R_2} \left[\begin{array}{cc|c} 1 & 1 & -2 \\ 0 & 1 & -5 \\ 0 & 1 & -5 \end{array} \right]$$

$$\xrightarrow{R_3 - R_2 = 1R_3} \left[\begin{array}{cc|c} 1 & 1 & -2 \\ 0 & 1 & -5 \\ 0 & 0 & 0 \end{array} \right]$$

$$\xrightarrow{R_1 - R_2 = 1R_1} \left[\begin{array}{cc|c} 1 & 0 & 3 \\ 0 & 1 & -5 \\ 0 & 0 & 0 \end{array} \right]$$

calc
key
interpret
+1
+2
+5

$$\Rightarrow \text{Sol set } \{ (3, -5) \}$$

Verify:

$$\begin{aligned} 3 + (-5) &= -2 \quad \checkmark \\ 5(3) + 2(-5) &= 15 - 10 = 5 \quad \checkmark \\ 3 + 2(-5) &= 3 - 10 = -7 \quad \checkmark \end{aligned}$$