Course Name: Linear Algebra Professor/Teacher: ______

Title of Homework: ______

Name: 刘怡婷 English Name: ______

SWJTU ID: 2019117865 OSU ID: ______ Date: ______

1. For what values of c are the folowing system inconsistent, with unique solution, or with infinitely many solution

$$x_1+2x_2-x_3=c$$
$$x_1+3x_2+x_3=1$$
$$3x_1+7x_2-x_3=4$$

derive the augmented matrix

$$\begin{bmatrix} 1 & 2 & -1 & c \\ 1 & 3 & 1 & 1 \\ 3 & 7 & -1 & 4 \end{bmatrix} \xrightarrow[E_{31}(-3)]{E_{21}(-1)} \begin{bmatrix} 1 & 2 & -1 & c \\ 0 & 1 & 2 & 1-c \\ 0 & 1 & 2 & 4-3c \end{bmatrix} \xrightarrow{E_{32}(-1)} \begin{bmatrix} 1 & 2 & -1 & c \\ 0 & 1 & 2 & 1-c \\ 0 & 0 & 0 & 3-2c \end{bmatrix}$$

when $3-2c\neq 0$, namely $c\neq\frac{3}{2}$, the system has no solution and is inconsistent

when $3-2c=0$, namely $c=\frac{3}{2}$, the augmented matrix becomes

$$\begin{bmatrix} 1 & 2 & -1 & \frac{3}{2} \\ 0 & 1 & 2 & -\frac{1}{2} \\ 0 & 0 & 0 & 0 \end{bmatrix} \xrightarrow{E_{12}(-2)} \begin{bmatrix} 1 & 0 & -5 & \frac{5}{2} \\ 0 & 1 & 2 & -\frac{1}{2} \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

so $x_1-5x_3=\frac{5}{2}$

$x_2+2x_3=-\frac{1}{2}$

x_3 is free

the system have infinitely many solution

Overall, $c=\frac{3}{2}$, the system has infinitely many solution

$c\neq\frac{3}{2}$, the system is inconsistent