Solve by jacobi Method For two steps and what The max.
absolute relative error after second iteration ?

① $4x + 2y + z = 11$

$-x + 2y = 3$, $x_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ → $x = \dfrac{11 - 2y - z}{4}$

$2x + y + 4z = 16$

$z = \dfrac{16 - 2x - y}{4}$

$y = \dfrac{3 + x}{2}$

$\begin{bmatrix} 4 & 2 & 1 \\ -1 & 2 & 0 \\ 2 & 1 & 4 \end{bmatrix}$ $\epsilon = \dfrac{x^{new} - x^{old}}{x^{new}} \times 100\%$

n	x	ϵ_1	y	ϵ_2	z	ϵ_3
0	1		1		1	
1	2	50%	2	50%	$\frac{13}{4}$	69.236%
2	$\frac{15}{16}$	113,33%	$\frac{5}{2}$	20%	$\frac{5}{2}$	30%

113,33%

max. = 113,33%

② $x - 4y + z = -2$ 1.2 $x = \dfrac{7 - 2y}{5}$

$y + 2z = 3$ 0.8 y

$5x + 2y = 7$ 1.2 $y = \dfrac{-2 - z - x}{-4}$ $z = \dfrac{3 - y}{2}$

= $5x + 2y = 7$ $\begin{bmatrix} 5 & -2 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 2 \end{bmatrix}$

$x - 4y + z = -2$

$y + 2z = 3$

n	x	ϵ_1	y	ϵ_2	z	ϵ_3
0	1.2		0.8		1.2	
1	1,0.8		1.47		0.75	
2	0.96		1.045		0.95	

3) Solve by gauss seidel two steps

$$56x + 23y = 2$$
$$66y - 13z = 3$$
$$3x - 5y + 47z = 1$$

$$X_0 = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$X = \frac{2 - 23y}{56}$$
$$y = \frac{1}{66}(3 + 13z)$$
$$z = \frac{1}{47}(1 - 3x + 5y)$$

Is diagonally dominant

n	X	y	z
0	0	0	0
1	$\frac{1}{28}$	$\frac{1}{22}$	0.02383
2	$\frac{3}{176}$	0.05014	0.02552

4) Solve by gauss seidel Three steps

$$\begin{bmatrix} 3 & -5 & 47 \\ 56 & 23 & 11 \\ 17 & 66 & -13 \end{bmatrix} \begin{bmatrix} X \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \quad , \quad X_0 \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \begin{bmatrix} 56 & 23 & 11 & | & 2 \\ 17 & 66 & -13 & | & 3 \\ 3 & -5 & 47 & | & 1 \end{bmatrix}$$

$$X = \frac{-23y - 11z + 2}{56} \quad , \quad y = \frac{3 + 13z - 17x}{66} \quad , \quad z = \frac{1 + 5y - 3x}{47}$$

n	X	y	z
0	0	0	0
1	$\frac{1}{28}$	$\frac{67}{1848}$	$\frac{1985}{86856}$
2	$\frac{5675}{347424}$	$\frac{1042017}{22929984}$	$\frac{27051419}{1077709248}$
3	0.0119941	0.047309	0.025437