Gaussian elimination

R1 $2x + 3y - 4z = 12$

R2 $x + 5y - z = 12$

R3 $3x + 7y - 3z = 20$

$R2 \rightarrow R2 - \frac{R1}{2}$

$\frac{R1}{2} \rightarrow x + \frac{3}{2}y - 2z = 6$

R_2' $0 + \left(5 - \frac{3}{2}\right)y + 2z - z = 6$

$0x + \frac{7}{2}y + z = 6$

$R1$ $2x + 3y - 4z = 12$

$R2'$ $0x + \frac{7}{2}y + z = 6$

$R3$ $3x + 7y - 3z = 20$

$R3 \rightarrow R3 - R1 * \frac{3}{2}$

$R1 * \frac{3}{2} \rightarrow 3x + \frac{9}{2}y - 6z = 18$

$R3' \rightarrow 0 + \left(7 - \frac{9}{2}\right)y - 3z + 6z = 2$

$0x + \frac{5}{2}y + 3z = 2$

$R1)\ 2x + 3y - 4z = 12$

$R_2')\ 0x + \frac{7}{2}y + z = 6$

$R_3')\ 0x + \frac{5}{2}y + 3z = 2$

$R_3' \rightarrow R_3' - R_2' * \frac{5}{7}$

$R_2' \frac{5}{7} \rightarrow 0x + \frac{5}{2}y + \frac{5z}{7} = \frac{30}{7}$

$R_3''\ \ 0x + 0y + \left(3 - \frac{5}{7}\right)z = 2 - \frac{30}{7}$

$$\frac{16}{7}z = \frac{-16}{7}$$

matrix $(A' \; b')$ at the end

R_1 $2x + 3y - 4z = 12$

R_2' $0x + \frac{7}{2}y + z = 6$

R_3'' $\frac{16}{7}z = \frac{-16}{7}$

write the general code to do Gaussian elimination and use on the starting A and b to get these two matrices A' and b'

We have $a_{ik} x_k = b_k$

→ for row i

→ → for row j [$j > i$]

→ → → for all column $k > i$

① $a'_{jk} \rightarrow a_{jk} - a_{ik} * l_{ji}$

② $b'_j \rightarrow b_j - b_j * l_{ji}$

$$l_{ji} = \frac{a_{ji}}{a_{ii}}$$

example

$i = 1, j = 2$

$l_{21} = \frac{a_{21}}{a_{11}} = \frac{1}{2}$. (multiply a_{1k} with $1/2$)

then subtract from a_{2k} & replace as 2nd row