Task 2

1. $\begin{cases} 9x + 2y + 3z = 23 \\ 2x + 5y + z = 10 \\ 2x + 3y + 9z = 16 \end{cases}$

a). ① equation → 9 > sum of 2+3 = Dominant
   ② equation → 5 is not > sum of 2+1 = NOT Dominant
   ③ equation → 9 is > sum of 2+3 = Diagonally Dominant

   ∴ system is not Diagonally Dominant as a whole.

b). Gauss-seidel
   Iteration 1
   : $x = (23 - 2y - 3z)/9 = 2.556$
         $y = (10 - 2x - z)/5 = 1.4112$
         $z = (16 - 2x - 3y)/9 = 1.6131$

   iteration 2
   : $x = (23 - 2y - 3z)/9 = 2.7986$
         $y = (10 - 2x - z)/5 = 1.3745$
         $z = (16 - 2x - 3y)/9 = 1.6486$

   Iteration 3
   : $x = (23 - 2y - 3z)/9 = 2.8848$
         $y = (10 - 2x - z)/5 = 1.3610$
         $z = (16 - 2x - 3y)/9 = 1.6697$

   ∴ $x = 2.8848$
      $y = 1.3610$
      $z = 1.6697$

   $/|x(i)|$
   ↓

   Check ERROR %.
   ↳ error = max ($|x(i) - x(i-1)| / |y(i) - y(i-1)|/|y(i)|/|z(i) - z(i-1)|/|(zi)|$) × 100%.

   error = max ($|2.8848 - 2.8672|/|2.8848|, |1.3610 - 1.3639|/|1.3610|, |1.6697 - 1.6651|/|1.6697|$) × 100%.
         = max (0.0061, 0.0021, 0.0027) × 100%
         = 0.61 %.   < 1%.

2.
$$\begin{cases} 0.1x + 2y + 3z = 5.2 \\ 2x + 0.5y + z = 5.5 \\ 2x + 3y + 0.2z = 7.2 \end{cases}$$

a). Iteration 1:

$x = (5.2 - 2y - 3z) / 0.1 = -52y - 30z + 52$

$y = (5.5 - 2x - z) / 0.5 = -4x - 2z + 11$

$z = (7.2 - 2x - 3y) / 0.2 = -10x/3 - 15y/2 + 36$

Iteration 2:

$x = (5.2 - 2y - 3z) / 0.1 = -52y - 30z + 52$

$y = (5.5 - 2x - z) / 0.5 = -4x - 2z + 11$

$z = (7.2 - 2x - 3y) / 0.2 = -10x/3 - 15y/2 + 36$

b). conclusion, the values of x, y, and z does not change after the first iteration. Therefore, the system does not have a unique solution and the Gauss-Seidel method is considered to be not converge.