1 *Solve each system of equations completely. (Show at least enough work that I can tell which method you're using.)*

a $\begin{cases} x + y = 8 \\ x - y = 4 \end{cases}$

I'll solve this one by elimination; simply add these equations together, then solve for x:

$$\begin{aligned} x + y &= 8, \\ +\underline{x - y} &\underline{= 4}; \\ 2x \quad &= 12; \\ x \quad &= 6. \end{aligned}$$

Then substitute this into either of the original equations:

$$\begin{aligned} (6) + y &= 8; \\ y &= 2. \end{aligned}$$

Therefore,

$$(x, y) = (6, 2).$$

b $\begin{cases} x - y - z = 1 \\ 2x + 3y + z = 2 \\ 3x + 2y = 0 \end{cases}$

I'll solve this one by elimination too; I multiply the last equation by -1 and then add them all together:

$$\begin{aligned} x - y - z &= 1, \\ 2x + 3y + z &= 2, \\ +\underline{\quad -3x - 2y} &\underline{= 0}; \\ 0 &= 3. \end{aligned}$$

This statement is false, so there is **no solution**.

c $\begin{cases} x + 2y = 4 \\ 2x + 4y = 8 \end{cases}$

I'll solve this one by substitution, first solving the first equation for x:

$$\begin{aligned} x + 2y &= 4; \\ x &= -2y + 4. \end{aligned}$$

Now I can try to solve for y:

$$\begin{aligned} 2(-2y + 4) + 4y &= 8; \\ 8 &= 8. \end{aligned}$$

This came out as simply a true statement, so there is no unique solution; instead,

$$x = -2y + 4$$

is the only result. You could also solve for y and give the answer as

$$y = -\frac{1}{2}x + 2.$$