# MAT 167 HW 1

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§ 1.4

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- After reducing to a triangle system we have:
  $$\begin{aligned} 2x + 3y &= 1 \\ -6y &= 6 \end{aligned}$$
  So $y = -1$, back-substituting and solving for $x$ we get
  $2x + 3(-1) = 1 \implies 2x - 3 = 1 \implies 2x = 4 \implies x = 2.$
  So we have $x = 2, y = -1$.
- We verify that
  $$2\begin{bmatrix} 2 \\ 10 \end{bmatrix} + (-1)\begin{bmatrix} 3 \\ 9 \end{bmatrix} = \begin{bmatrix} 4 \\ 20 \end{bmatrix} + \begin{bmatrix} -3 \\ -9 \end{bmatrix} = \begin{bmatrix} 1 \\ 11 \end{bmatrix}$$
- If the right hand side changed to $\begin{bmatrix} 4 \\ 44 \end{bmatrix} = 4\begin{bmatrix} 1 \\ 11 \end{bmatrix}$, then the $x$ and $y$ values increase accordingly.
  That is $x = 4(2) = 8, y = 4(-1) = -4$

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i. If $a = 2$, then elimination breaks down permanently. As we will end up in an inconsistent system.

ii. If $a = 0$, then elimination breaks down temporarily until the first equation is swapped for the second.

We can solve by elimination if we swap the equations
$$\left.\begin{aligned} 4x + 6y &= 6 \\ 3y &= -3 \end{aligned}\right\} \implies \left.\begin{aligned} 4x + 6y &= 6 \\ y &= -1 \end{aligned}\right\} \implies \left.\begin{aligned} 4x \quad &= 12 \\ y &= -1 \end{aligned}\right\} \implies \left.\begin{aligned} x \quad &= 3 \\ y &= -1 \end{aligned}\right\}$$
So, $x = 3, y = -1$.

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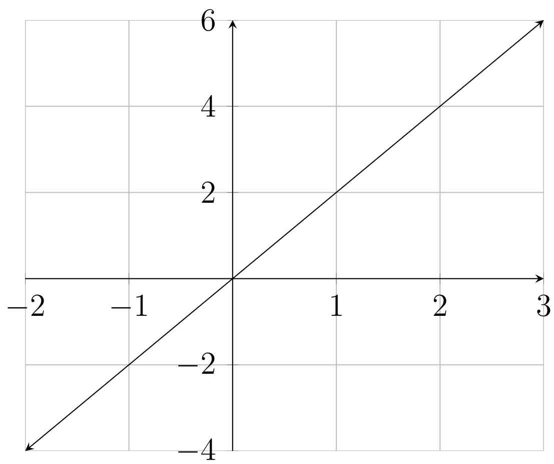
- These two equations have a solution only when $2b_1 = b_2$.
- There are infinitely many solutions.

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