MAT 167 HW 1

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§ 1.4 2

- After reducing to a triangle system we have:
  $2x + 3y = 1$
  $\quad - 6y = 6$
  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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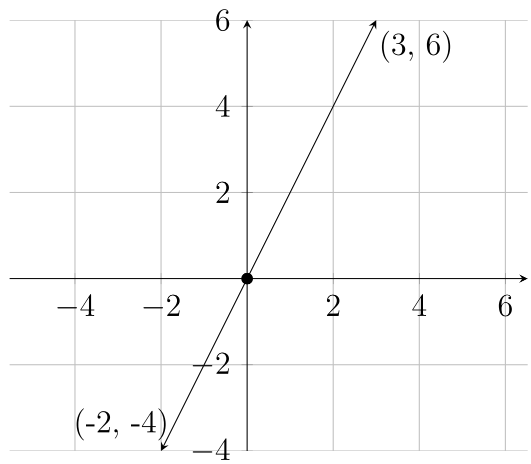
- These two equations have a solution only when $2b_1 = b_2$.
- There are infinitely many solutions.



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