

Source: [KBe2020math530refExrOnRetIndex](#)

## Solve Equations

LinAlg 9 Sep 2020 More Systems and proofs

$$\begin{bmatrix} 2 & -1 & x \\ 3 & 2 & 1 & y \\ 1 & -1 & 2 & z \end{bmatrix} = \begin{bmatrix} -1 \\ 1 \\ 4 \end{bmatrix}$$

1. add (1) and (3) to (2)

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 3 & 2 & 1 & y \\ 1 & -1 & 2 & z \end{bmatrix}$$

2. subtract (1) from (2) to (2)

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 3 & 2 & 1 & y \\ 1 & -1 & 2 & z \end{bmatrix}$$

3. divide (2) by 3

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & -1 & 2 & y \\ 1 & -1 & 2 & z \end{bmatrix}$$

4. subtract 1-2 from 1-12

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & z \end{bmatrix}$$

5. divide (2) by 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & z \end{bmatrix}$$

6. subtract (2) from (3)

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

7. (3) \* = 1

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

8. subtract 8.(3) from 1

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

9. (1) \* = 1

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

10. swap 1 and 2

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

11. swap 1 and 2

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

12. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

13. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

14. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

15. swap 1 and 2

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

16. swap 1 and 2

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

17. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

18. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

19. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

20. swap 1 and 2

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

21. swap 1 and 2

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

22. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

23. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

24. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

25. swap 1 and 2

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

26. swap 1 and 2

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

27. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

28. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

29. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

30. swap 1 and 2

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

31. swap 1 and 2

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

32. swap 1 and 2

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{math>$$

Operation timed out. Arithmetic errors.

## Read 1.B and 1.C

### General Notes

- The distributive property is extremely useful ### 1.35 Example
- a) If  $b = 0$  then we can divide all  $x_3$  by 5 and combine the last two terms to get  $F^3$ , which is a vector space, without loss of generality. If not, then when you try to multiply by a scalar then you will find that the above reasoning breaks (i think).
- b)  $f(x) = 0$  is continuous, so the additive identity exists. All sums of continuous functions result in continuous functions, so it is closed under addition. And all scalar multiples also work out.
- c) slightly awkward: i don't actually know what a differentiable real valued function is. #todo-exrOn
- d) (see above)
- e) what does it mean for a sequence of complex numbers to have a limit 0? but I think you can use the same argument that the missing elements are just "collapsed" into one invisible one. ### 1.40 Definition direct sum

- Something about uniqueness?
  - If there is only one way to write zero then it works (1.44 Condition for a direct sum)

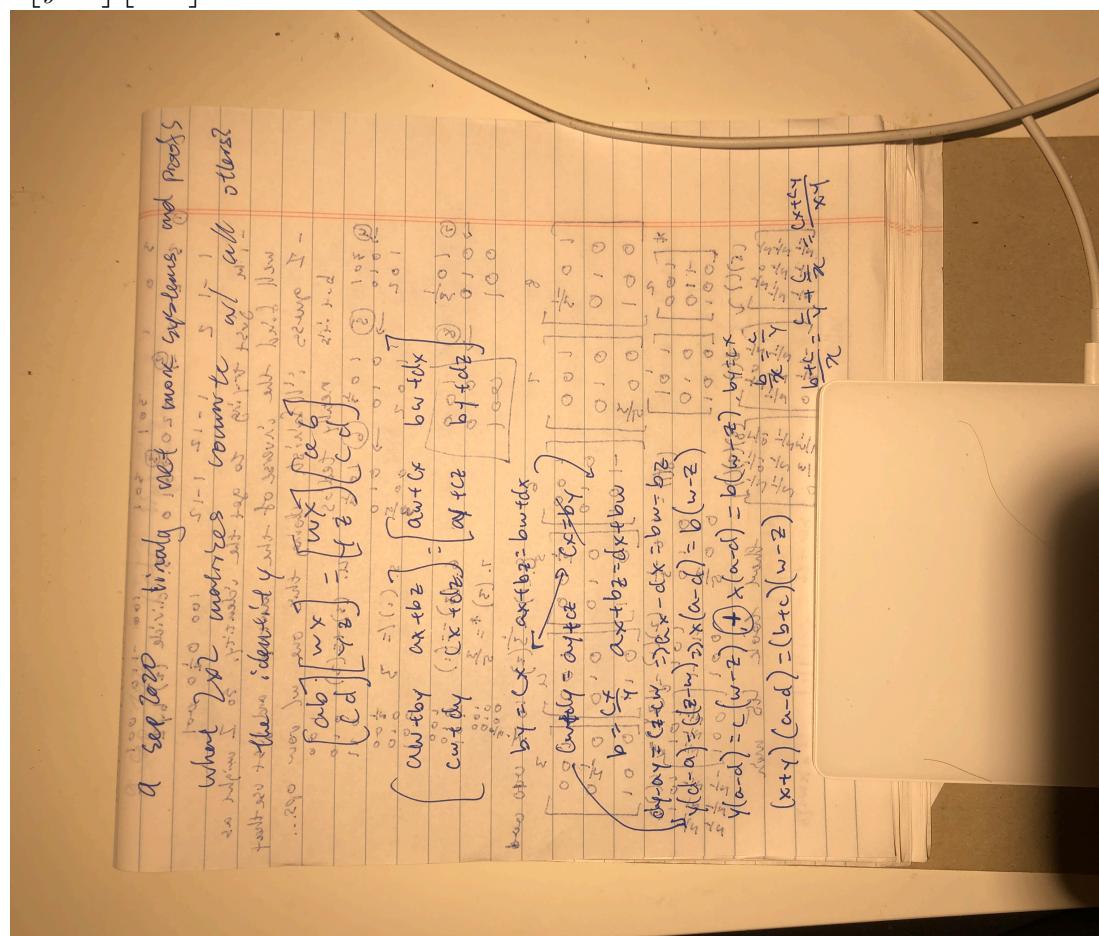
## **Exercise to present**

I would be interested in 7, 8, 10, 12, 14-19

## 2x2 Matrices that are Commutative

(under multiplication, with all other  $2 \times 2$  matrices)

Starting with  $\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} w & x \\ y & z \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ , I got  $(x+y)(a-d) = (b+c)(w-z)$  and  $by = cx$ , but wasn't



sure how to further develop it.

## Epilogue

Linear algebra homework always takes so long. Even though I skip like half of the problems. This is kind of an issue.