4. Practice elimination

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Lecture due Sep 15, 2021 20:30 IST

Practice

Practice elimination 1

7/7 points (graded)

Goal: Find $\vec{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ such that

$$\begin{aligned} (1)\ x_1 + 2x_2 &= 1 \\ (2)\ x_1 - x_2 &= 7 \end{aligned}$$

What equation is obtained by adding equations (1) and (2)? Let this equation be $ax_1 + bx_2 = c$. Fill in the blanks:

$a =$ 2 ✔ **Answer:** 2

$b =$ 1 ✔ **Answer:** 1

$c =$ 8 ✔ **Answer:** 8

What equation is obtained by adding two of equation (2) to equation (1)? Let this equation be $ax_1 + bx_2 = c$. Fill in the blanks:

$a =$ 3 ✔ **Answer:** 3

$b =$ 0 ✔ **Answer:** 0

$c =$ 15 ✔ **Answer:** 15

Now solve the problem.

(Enter a vector using notation such as `[a,b]`.)

The unknown $\vec{x} =$ [5,-2] ✔ **Answer:** [5,-2]

? INPUT HELP

Solution:

Adding equations (1) and (2) results in $2x_1 + x_2 = 8$. This equation is not helpful for elimination.

But adding two of equation (2) to equation (1) results in $3x_1 = 15$, which tells us the value of x_1 is 5.

Substituting $x_1 = 5$ into the second equation gives $5 - x_2 = 7$ from which we obtain $x_2 = -2$. So the answer is $\vec{x} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$. One can also substitute back into equation (1).

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Answers are displayed within the problem

Practice elimination 2

4/4 points (graded)

Goal: Find $\vec{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ such that

$$(1)\ 3x_1 - 3x_2 = 6$$
$$(2)\ 2x_1 + x_2 = 4$$

We start by eliminating x_2 because it will make the algebra easier. What constant multiple of equation (2) can be added to (1) in order to eliminate x_2?

3 ✔ **Answer:** 3

Let the equation obtained by adding the above multiple of equation (2) to equation (1) be $ax_1 = b$. Fill in the blanks:

$a =$ 9 ✔ **Answer:** 9

$b =$ 18 ✔ **Answer:** 18

Now solve the problem.

(Enter a vector using notation such as `[a,b]`.)

The unknown $\vec{x} =$ [2,0] ✔ **Answer:** [2,0]

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Solution:

Since there is a $-3x_2$ in equation (1), and a x_2 in equation (2), we need to add three of equation (2) to equation (1) to make the coefficient on x_2 equal 0.

The resulting equation is $9x_1 = 18$.

From this we see that $x_1 = 2$, and substituting into equation (1) we can solve to get $x_2 = 0$.

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Practice elimination 3

1/1 point (graded)

Let $A = \begin{pmatrix} 3 & -1 \\ 2 & 1 \end{pmatrix}$. Find $\vec{x}$ such that $A\vec{x} = \begin{pmatrix} 7 \\ 8 \end{pmatrix}$.

(Enter a vector using notation such as `[a,b]`.)

$\vec{x} =$ [3,2] ✔ **Answer:** [3,2]

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Solution:

The system of equations is

$$3x_1 - x_2 = 7 \tag{5.60}$$
$$2x_1 + x_2 = 8 \tag{5.61}$$

Adding both equations together gives

$$5x_1 = 15. \tag{5.62}$$

Thus $x_1 = 3$. Substituting into either equation and solving, we obtain $x_2 = 2$.

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Answers are displayed within the problem

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