2.4.3 It Goes Both Ways

2.4.3 It Goes Both Ways

Discussion

Hide Discussion

Topic: Week 2 / 2.4.3

Add a Post

Show all posts ▼ by recent activity ▼

There are no posts in this topic yet.

✖

Homework 2.4.3.1

1/1 point (graded)

Which is the linear transformation that corresponds to the matrix

$$\begin{pmatrix} 2 & 1 & 0 & -1 \\ 0 & 0 & 1 & -1 \end{pmatrix}$$

- $$f(\begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \\ \chi_3 \end{pmatrix}) = \begin{pmatrix} \chi_0 + \chi_2 \\ \chi_1 + \chi_3 \end{pmatrix}$$

- $$f(\begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \\ \chi_3 \end{pmatrix}) = \begin{pmatrix} 2\chi_0 + \chi_1 \\ \chi_1 \\ \chi_0 \\ \chi_0 + \chi_1 \end{pmatrix}$$

$$f(\begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \\ \chi_3 \end{pmatrix}) = \begin{pmatrix} 2\chi_0 \\ \chi_1 \end{pmatrix}$$

$$f(\begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \\ \chi_3 \end{pmatrix}) = \begin{pmatrix} 2\chi_0 + \chi_1 - \chi_3 \\ \chi_2 - \chi_3 \end{pmatrix}$$ ✔

none of the above

Explanation

Answer: $f(\begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \\ \chi_3 \end{pmatrix}) = \begin{pmatrix} 2 & 1 & 0 & -1 \\ 0 & 0 & 1 & -1 \end{pmatrix} \begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \\ \chi_3 \end{pmatrix} = \begin{pmatrix} 2\chi_0 + \chi_1 - \chi_3 \\ \chi_2 - \chi_3 \end{pmatrix}.$

Submit

Answers are displayed within the problem

Homework 2.4.3.2

1/1 point (graded)

Which is the linear transformation that corresponds to the matrix

$$\begin{pmatrix} 2 & 1 \\ 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{pmatrix}$$

- ○ $f(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}) = \begin{pmatrix} \chi_0 + \chi_2 \\ \chi_1 + \chi_3 \end{pmatrix}$
- ◉ $f(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}) = \begin{pmatrix} 2\chi_0 + \chi_1 \\ \chi_1 \\ \chi_0 \\ \chi_0 + \chi_1 \end{pmatrix}$ ✔
- ○ $f(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}) = \begin{pmatrix} 2\chi_0 \\ \chi_1 \end{pmatrix}$
- ○ $f(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}) = \begin{pmatrix} 2\chi_0 + \chi_1 - \chi_3 \\ \chi_2 - \chi_3 \end{pmatrix}$
- ○ none of the above

Explanation

Answer: $f(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}) = \begin{pmatrix} 2 & 1 \\ 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix} = \begin{pmatrix} 2\chi_0 + \chi_1 \\ \chi_1 \\ \chi_0 \\ \chi_0 + \chi_1 \end{pmatrix}.$

Submit

Answers are displayed within the problem

Homework 2.4.3.3

1/1 point (graded)

Let f be a vector function such that $f(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}) = \begin{pmatrix} \chi_0^2 \\ \chi_1 \end{pmatrix}$ then

- (a) f is a linear transformation.
- (b) f is not a linear transformation. ✔
- (c) Not enough information is given to determine whether or not f is a linear transformation.

Explanation

Answer: (b): To compute a possible matrix that represents f consider:

$$f(\begin{pmatrix} 1 \\ 0 \end{pmatrix}) = \begin{pmatrix} 1^2 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad \text{and} \quad f(\begin{pmatrix} 0 \\ 1 \end{pmatrix}) = \begin{pmatrix} 0^2 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}.$$

Thus, *if* f is a linear transformation, then $f(x) = Ax$ where $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$. Now,

$$Ax = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix} = \begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix} \neq \begin{pmatrix} \chi_0^2 \\ \chi_1 \end{pmatrix} = f\left(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}\right) = f(x).$$

Hence f is *not* a linear transformation since $f(x) \neq Ax$.

Submit

Answers are displayed within the problem

Homework 2.4.3.4

2/2 points (graded)

Let f be a vector function such that $f(\begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \end{pmatrix}) = \begin{pmatrix} \chi_0 \\ 0 \\ \chi_2 \end{pmatrix}$ then

- (selected) f is a linear transformation. ✔
- f is not a linear transformation.
- Not enough information is given to determine whether or not f is a linear transformation.

Let f be a vector function such that $f(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}) = \begin{pmatrix} \chi_0^2 \\ 0 \end{pmatrix}$ then

- f is a linear transformation.
- (selected) f is not a linear transformation. ✔
- Not enough information is given to determine whether or not f is a linear transformation.

Explanation

- $f(\begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \end{pmatrix}) = \begin{pmatrix} \chi_0 \\ 0 \\ \chi_2 \end{pmatrix}$.

  Answer: True To compute a possible matrix that represents f consider:

$$f(\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}) = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, \quad f(\begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}) = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \quad \text{and} \quad f(\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}) = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}.$$

  Thus, *if* f is a linear transformation, then $f(x) = Ax$ where $A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$. Now,

$$Ax = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \end{pmatrix} = \begin{pmatrix} \chi_0 \\ 0 \\ \chi_2 \end{pmatrix} = f\left(\begin{pmatrix} \chi_0 \\ \chi_1 \\ \chi_2 \end{pmatrix}\right) = f(x).$$

  Hence f is a linear transformation since $f(x) = Ax$.

- $f(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}) = \begin{pmatrix} \chi_0^2 \\ 0 \end{pmatrix}$.

  Answer: False To compute a possible matrix that represents f consider:

$$f(\begin{pmatrix} 1 \\ 0 \end{pmatrix}) = \begin{pmatrix} 1^2 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad \text{and} \quad f(\begin{pmatrix} 0 \\ 1 \end{pmatrix}) = \begin{pmatrix} 0^2 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}.$$

  Thus, *if* f is a linear transformation, then $f(x) = Ax$ where $A = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$. Now,

$$Ax = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix} = \begin{pmatrix} \chi_0 \\ 0 \end{pmatrix} \neq \begin{pmatrix} \chi_0^2 \\ 0 \end{pmatrix} = f\left(\begin{pmatrix} \chi_0 \\ \chi_1 \end{pmatrix}\right) = f(x).$$

  Hence f is *not* a linear transformation since $f(x) \neq Ax$.

Submit

Answers are displayed within the problem