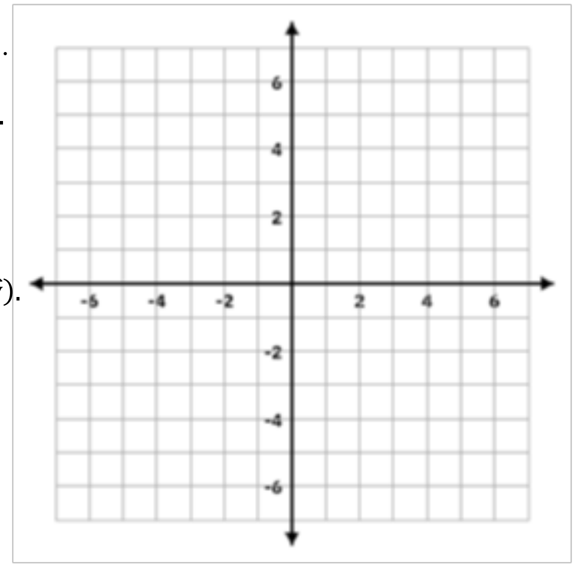
AP Precalc

4.12 Linear Transformations and Matrices

4.12 Notes

Write your questions and thoughts here!

Ex 1: Apply the transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ if $A = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$.



a. If $\vec{\mathrm{u}} = \langle 4, 1 \rangle$, find $T(\vec{\mathrm{u}})$ and sketch both $\vec{\mathrm{u}}$ and $T(\vec{\mathrm{u}})$.

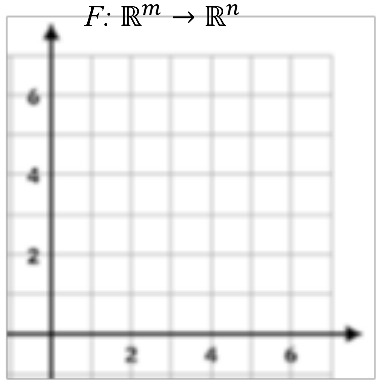
b. If $\vec{\mathrm{v}} = \langle -2, 3 \rangle$, find $T(\vec{\mathrm{v}})$ and sketch both $\vec{\mathrm{v}}$ and $T(\vec{\mathrm{v}})$.

c. Describe the transformation that occurs.

d. What is the general transformation that occurs to $\langle x, y \rangle$.

If the domain of a function *f* is $\mathbb{R}^n$ and the range is $\mathbb{R}^m$, where *m* and *n* could be equal, then *f* is called a map or transformation from $\mathbb{R}^n$ to $\mathbb{R}^m$.

$F: \mathbb{R}^m \to \mathbb{R}^n$



For a function to be a linear transformation it must maintain the following criteria:

a) Vector Addition under a transformation: $T(\vec{u} + \vec{v}) = T(\vec{u}) + T(\vec{v})$
b) Scalar Multiplication: $cT(\vec{u}) = T(c\vec{u})$

Ex 2: Prove T: $\mathbb{R}^2 \to \mathbb{R}^2$ given by T $(\langle x, y \rangle) \to \langle -x, y \rangle$ is a linear transformation.

Write your questions

Ex 3: Determine if T: $\mathbb{R}^2 \rightarrow \mathbb{R}^2$ given by T $(\langle x, y \rangle) \rightarrow \langle x + y, x^2 \rangle$ is a linear transformation.

Ex 4: Function *f* is the following linear transformation: T $(\langle x, y \rangle) \rightarrow \langle 3x + 2y, 3y \rangle$.

Identify the matrix expression that would determine the result of T: $\langle 2, 3 \rangle$

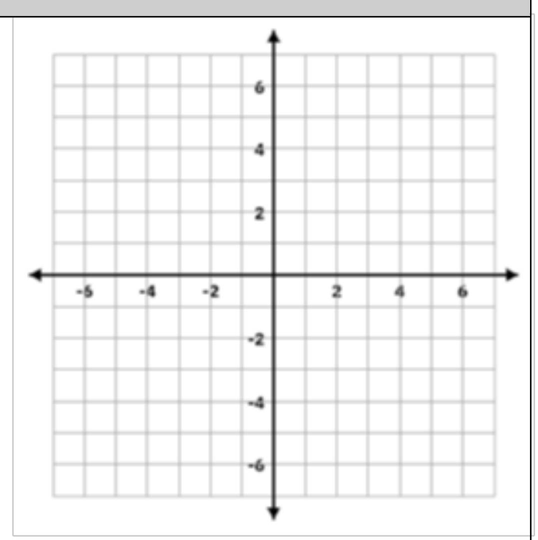
4.12 Linear Transformations and Matrices

AP Precalculus

4.12 Practice

Directions: Apply the transformation for each matrix *A*.

1) Apply the transformation T: $\mathbb{R}^2 \rightarrow \mathbb{R}^2$ if $A = \begin{bmatrix} 2 & 0 \\ 0 & -2 \end{bmatrix}$.



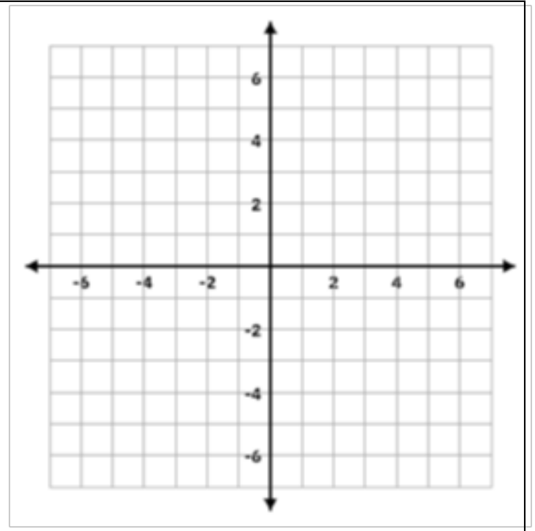
a. If $\vec{u} = \langle 3, 2 \rangle$, find $T(\vec{u})$ and sketch both $\vec{u}$ and $T(\vec{u})$.

b. If $\vec{v} = \langle 2, -4 \rangle$, find $T(\vec{v})$ and sketch both $\vec{v}$ and $T(\vec{v})$.

c. Describe the transformation that occurs.

d. What is the general transformation that occurs to $\langle x, y \rangle$.

2) Apply the transformation T: $\mathbb{R}^2 \to \mathbb{R}^2$ if $A = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$.



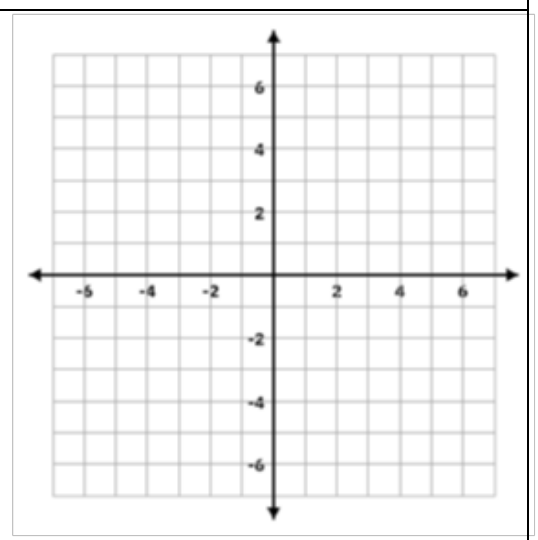
a. If $\vec{u} = \langle -4, 5 \rangle$, find $T(\vec{u})$ and sketch both $\vec{u}$ and $T(\vec{u})$.

b. If $\vec{v} = \langle -2, -4 \rangle$, find $T(\vec{v})$ and sketch both $\vec{v}$ and $T(\vec{v})$.

c. Describe the transformation that occurs.

d. What is the general transformation that occurs to $\langle x, y \rangle$.

3) Apply the transformation T: $\mathbb{R}^2 \to \mathbb{R}^2$ if $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$.



a. If $\vec{u} = \langle -6, 3 \rangle$, find $T(\vec{u})$ and sketch both $\vec{u}$ and $T(\vec{u})$.

b. If $\vec{v} = \langle 2, -5 \rangle$, find $T(\vec{v})$ and sketch both $\vec{v}$ and $T(\vec{v})$.

c. Describe the transformation that occurs.

d. What is the general transformation that occurs to $\langle x, y \rangle$.

Directions: Determine if T: $\mathbb{R}^2 \to \mathbb{R}^2$ given by T $(\langle x, y\rangle)$ is a linear transformation.

4) **T** $(\langle \boldsymbol{x}, \boldsymbol{y}\rangle) \to \langle \boldsymbol{xy}, \boldsymbol{x}+\boldsymbol{y}\rangle$

5) **T** $(\langle \boldsymbol{x}, \boldsymbol{y}\rangle) \to \langle -\boldsymbol{y}, -\boldsymbol{x}\rangle$

Directions: Function *f* is the given linear transformation. Identify the matrix expression that would determine the result of the given transformation.

7) T $(\langle x, y\rangle) \to \langle x-y, x+3y\rangle$.

Identify the matrix expression that would determine the result of T: $\langle 1,-4\rangle$

8) T $(\langle x, y\rangle) \to \langle x-2y, -2x\rangle$.

Identify the matrix expression that would determine the result of T: $\langle 0, 6\rangle$

9) T $(\langle x, y\rangle) \to \langle -y, x\rangle$.

Identify the matrix expression that would determine the result of T: $\langle 10,-3\rangle$

10) T $(\langle x, y\rangle) \to \langle 2x+3y, 2x-y\rangle$.

Identify the matrix expression that would determine the result of T: $\langle 1,-1\rangle$

11. (2.13A) Solve the equation $\log_b a + \log_b 5 = c$ for a.

(A) $\frac{5}{b^c}$

(B) $5b^c$

(C) $b^c - 5$

(D) $\frac{b^c}{5}$

12. (2.13B) When considering the equation $\log(x-3) + \log(5) > \log(x+9)$, which of the following represents the domain of all solutions to the inequality?

(A) $(3, \infty)$

(B) $(5, \infty)$

(C) $(-9, \infty)$

(D) $(6, \infty)$

13. (2.10) Which of the following represents a possible function that is the inverse of $f(x) = 0.25^x$?

(A)

x	$f(x)$
-3	64
-2	16
-1	4
0	1

(B)

x	$f(x)$
4	-1
1	0
$\frac{1}{4}$	1
$\frac{1}{16}$	2

(C)

(D)