## Readiness Assurance Test

Choose the most appropriate response for each question.

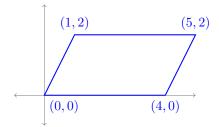
1) Find the area of the parallelogram with vertices (0,0), (4,0), (5,2), and (1,2).











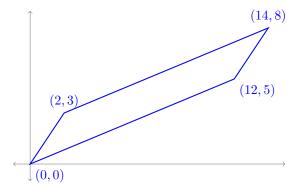
2) Find the area of the parallelogram with vertices (0,0), (12,5), (14,8), and (2,3).











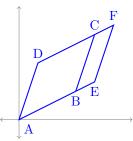
3) The parallelogram ABCD has area 6. If AE is  $\frac{3}{2}$  the length of AB, what is the area of the parallelogram AEFD?











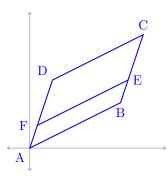
4) The parallelogram ABCD has area 6. If AF is one third as long as AD, what is the area of the parallelogram ABEF?











5) Let 
$$T: \mathbb{R}^2 \to \mathbb{R}$$
 be a linear transformation. Which of the following is equal to  $T\left(\begin{bmatrix} a+b\\a+b \end{bmatrix}\right)$ ?

(a) 
$$T\left(\begin{bmatrix} a \\ b \end{bmatrix}\right)$$

(c) 
$$T\left(\begin{bmatrix} a \\ b \end{bmatrix}\right) + T\left(\begin{bmatrix} b \\ a \end{bmatrix}\right)$$

(b) 
$$2T\left(\begin{bmatrix} a \\ b \end{bmatrix}\right)$$

$$\text{(d)} \ \ T\left(\begin{bmatrix} a \\ a \end{bmatrix}\right) + T\left(\begin{bmatrix} a \\ b \end{bmatrix}\right) + T\left(\begin{bmatrix} b \\ a \end{bmatrix}\right) + T\left(\begin{bmatrix} b \\ b \end{bmatrix}\right)$$

- 6) Let  $T: \mathbb{R}^n \to \mathbb{R}^n$  be a linear transformation with associated matrix  $A \in M_n(\mathbb{R})$ . Three of the four answer choices are equivalent to each other; which one is not equivalent to the other three?
  - (a) A is not an invertible matrix
  - (b) T has a non-trivial kernel
  - (c)  $\det(A) \neq 0$
  - (d)  $A\vec{x} = \vec{b}$  has multiple solutions for all  $\vec{b} \in \mathbb{R}^n$ .

7) What is the matrix corresponding to the linear transformation 
$$T: \mathbb{R}^3 \to \mathbb{R}^3$$
 given by  $T\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) =$ 

$$\begin{bmatrix} 3x + 2y - z \\ y + z \\ x + 7z \end{bmatrix}$$
?

(a) 
$$\begin{bmatrix} 3 & 2 & -1 \\ 0 & 1 & 1 \\ 1 & 0 & 7 \end{bmatrix}$$

(b) 
$$\begin{bmatrix} 3 & 0 & 1 \\ 2 & 1 & 0 \\ -1 & 1 & 7 \end{bmatrix}$$

(c) 
$$\begin{bmatrix} 3 & 2 & -1 \\ 1 & 1 & 0 \\ 1 & 7 & 0 \end{bmatrix}$$

(a) 
$$\begin{bmatrix} 3 & 2 & -1 \\ 0 & 1 & 1 \\ 1 & 0 & 7 \end{bmatrix}$$
 (b) 
$$\begin{bmatrix} 3 & 0 & 1 \\ 2 & 1 & 0 \\ -1 & 1 & 7 \end{bmatrix}$$
 (c) 
$$\begin{bmatrix} 3 & 2 & -1 \\ 1 & 1 & 0 \\ 1 & 7 & 0 \end{bmatrix}$$
 (d) 
$$\begin{bmatrix} 3 & 1 & 1 \\ 2 & 1 & 7 \\ -1 & 0 & 0 \end{bmatrix}$$

- 8) Which of the following conditions imply that the quadratic polynomial  $ax^2 + bx + c$  has no real roots?
  - (a) a < 0
  - (b)  $b^2 4ac < 0$
  - (c)  $ac b^2 < 0$
  - (d)  $ab + c^2 < 0$
- 9) Which of the following is a root of the polynomial  $x^2 4x + 13$ ?

(a) 1 + 2i

(b) 2 - 3i

(c) 3 + 4i

(d) 4 - 5i

10) How many roots does the polynomial  $x^4 + 3x^3 + x^2 - 3x - 2$  have?

(a) 1

(b) 2

(c) 3

(d) 4