## Readiness Assurance Test

Choose the most appropriate response for each question.

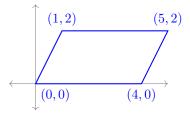
1) Find the area of the parallelogram with vertices (0,0), (4,0), (5,2), and (1,2).







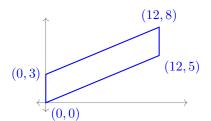




2) Find the area of the parallelogram with vertices (0,0), (12,5), (12,8), and (0,3).

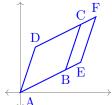






3) The parallelogram ABCD has area 6. If AE is 50% longer than AB, what is the area of the parallelogram AEFD?

(c) 
$$12$$



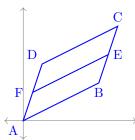
4) The parallelogram ABCD has area 6. If AD is twice as long as AF, what is the area of the parallelogram ABEF?











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

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

- (d)  $2T \begin{pmatrix} a \\ b \end{pmatrix}$
- 6) Let  $T: \mathbb{R}^n \to \mathbb{R}^n$  be a linear transformation with standard matrix A. Which of the following is equivalent to the statement "A is an invertible matrix"?
  - (a) A is a square matrix
  - (b) The matrix equation AX = B has no solution for some  $n \times 1$  matrix B.
  - (c) RREF(A) has a column without a pivot
  - (d) T is both injective and surjective
- 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)  $\begin{bmatrix} 3 & 0 & 1 \\ 2 & 1 & 0 \\ -1 & 1 & 7 \end{bmatrix}$  (b)  $\begin{bmatrix} 3 & 2 & -1 \\ 0 & 1 & 1 \\ 1 & 0 & 7 \end{bmatrix}$  (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) How many distinct real roots does the polynomial  $x^4 + 3x^3 + x^2 3x 2$  have? (Hint: all the roots are rational.)
  - (a) 4

(b) 3

(c) 2

- (d) 1
- 9) Which of the following is a root of the polynomial  $x^2 4x + 13$ ?
  - (a) 2 3i
- (b) 3 + 4i
- (c) 4 5i
- (d) 5 + 6i
- 10) Which of the following conditions imply that the quadratic polynomial  $ax^2 + bx + c$  has no real roots?
  - (a)  $b^2 4ac < 0$

(c)  $ac - 4b^2 < 0$ 

(b)  $a^2 + 4bc < 0$ 

(d)  $ab + 4c^2 < 0$