

## 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  $(1, 2)$ .

- (a) 8
- (b) 10
- (c) 12
- (d) 14



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

- (a) 36
- (b) 54
- (c) 72
- (d) 96



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

- (a) 18
- (b) 15
- (c) 12
- (d) 9



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

- (a) 1
- (b) 2
- (c) 3
- (d) 4



- 5) Let  $T : \mathbb{R}^2 \rightarrow \mathbb{R}$  be a linear transformation. Which of the following is equal to  $2T\left(\begin{bmatrix} a+b \\ a+b \end{bmatrix}\right)$ ?
- (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)  $2T\left(\begin{bmatrix} a \\ b \end{bmatrix}\right)$
- 6) Let  $T : \mathbb{R}^n \rightarrow \mathbb{R}^n$  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)  $\text{RREF}(A)$  has a column without a pivot  
 (d)  $T$  is both injective and surjective
- 7) What is the matrix corresponding to the linear transformation  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$  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)  $ab + 4c^2 < 0$