

## Affine and Convex Combinations

1. How do you describe the set of all affine combinations of the vectors  $(1, 0)$  and  $(0, 1)$ ?
  - (a) A point
  - (b) A line segment
  - (c) A line
  - (d)  $\mathbb{R}^2$
  - (e)  $\mathbb{R}^3$
2. How do you describe the set of all convex combinations of the vectors  $(1, 0)$  and  $(0, 1)$ ?
  - (a) A point
  - (b) A line segment
  - (c) A line
  - (d)  $\mathbb{R}^2$
  - (e)  $\mathbb{R}^3$
3. How do you describe the set of all affine combinations of the vectors  $(1, 0)$  and  $(0, 1)$  and  $(1, 1)$ ?
  - (a) Three lines (the lines through each pair of vectors)
  - (b) The boundary of the triangle formed by these three vectors
  - (c) The boundary and interior of the triangle formed by these three vectors
  - (d)  $\mathbb{R}^2$
4. How do you describe the set of all convex combinations of the vectors  $(1, 0)$  and  $(0, 1)$  and  $(1, 1)$ ?
  - (a) Three lines (the lines through each pair of vectors)
  - (b) The boundary of the triangle formed by these three vectors
  - (c) The boundary and interior of the triangle formed by these three vectors
  - (d)  $\mathbb{R}^2$

5. Suppose  $x$  and  $y$  both solve  $Ax = b$ . **True or False** All linear combinations of  $x$  and  $y$  also solve  $Ax = b$ . (You should be prepared to support your answer with either a proof or a counterexample.)
6. Suppose  $x$  and  $y$  both solve  $Ax = b$ . **True or False** All affine combinations of  $x$  and  $y$  also solve  $Ax = b$ . (You should be prepared to support your answer with either a proof or a counterexample.)
7. What is the maximum number of affinely independent vectors in  $\mathbb{R}^n$ ?
- (a)  $n - 1$
  - (b)  $n$
  - (c)  $n + 1$
8. Which of the following statements is correct?
- (a) A set of vectors that is linearly independent must be affinely independent.
  - (b) A set of vectors that is affinely independent must be linearly independent.
  - (c) Both statements are true.