MathQuest: Linear Algebra

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) $\Re^2$
   (e) $\Re^3$

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) $\Re^2$
   (e) $\Re^3$

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) $\Re^2$

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) $\Re^2$

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.)

   (a) True, and I am very confident

   (b) True, but I am not very confident

   (c) False, but I am not very confident

   (d) False, and I am very confident

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.)

   (a) True, and I am very confident

   (b) True, but I am not very confident

   (c) False, but I am not very confident

   (d) False, and I am very confident

7. What is the maximum number of affinely independent vectors in $\Re^n$?

   (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.