

Math 1553 Worksheet §2.1, §2.2, §2.3

1. Write a set of three vectors whose span is a plane in  $\mathbf{R}^3$ .

2. Consider the system of linear equations

$$\begin{aligned}x + 2y &= 7 \\2x + y &= -2 \\-x - y &= 4.\end{aligned}$$

**Question:** Does this system have a solution? If so, what is the solution set?

a) Formulate this question as an augmented matrix.

b) Formulate this question as a vector equation.

c) Formulate this question into matrix equation  $Ax = b$ .

d) What does this mean in terms of spans?

e) Answer the question using the [interactive demo](#).

f) Answer the question using row reduction.

- 3.** Paul Drake has challenged you to find his hidden treasure, located at some point  $(a, b, c)$ . He has honestly guaranteed you that the treasure can be found by starting at the origin and taking steps in directions given by

$$v_1 = \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix} \quad v_2 = \begin{pmatrix} 5 \\ -4 \\ -7 \end{pmatrix} \quad v_3 = \begin{pmatrix} -3 \\ 1 \\ 0 \end{pmatrix}.$$

By decoding Paul's message, you have discovered that the first and second coordinates of the treasure's location are (in order)  $-4$  and  $3$ .

- a)** What is the treasure's full location?

- b)** Give instructions for how to find the treasure by only moving in the directions given by  $v_1$ ,  $v_2$ , and  $v_3$ .