Problems Day 29, F 3/15/2024
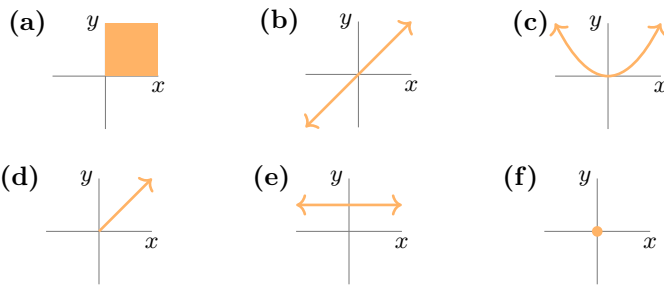## Topic 13: Linear Algebra
Jeremy Orloff

Problem 1. Which of the following are vector spaces?

(a) $\mathbf{R}^2$

(b) {all functions of t}

(c) $\{(x,1)\,|\,x \text{ any value}\}$

(d) Set of all solutions to $P(D)x = 0$.

(e) Set of all solutions to $P(D)x = \cos(3t)$

(f) $\{(x,0,z)\}$

Problem 2. Are the following shaded (orange) sets vector spaces?

Problem 3. Do the following matrix multiplications twice. First as in 18.02. Second as a linear combination of the columns.

(a) $\begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}\begin{bmatrix} -1 \\ 3 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$.

Problem 4. Compute $\begin{bmatrix} \overrightarrow{\mathbf{v_1}} & \overrightarrow{\mathbf{v_2}} & \ldots & \overrightarrow{\mathbf{v_n}} \end{bmatrix}\begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_n \end{bmatrix}$. (Here, $\overrightarrow{\mathbf{v_j}}$ represents the jth column of the matrix.)

MIT OpenCourseWare

https://ocw.mit.edu

ES.1803 Differential Equations

Spring 2024