Math 311 Hwk 3

Show your work. Always provide both code and output.

Problem 1 (25 points). *If A is an $m \times n$ matrix, show that*

$$\|A\|_\infty = \sup_{1 \le i \le m} \left(\sum_{j=1}^{n} |a_{ij}| \right).$$

Problem 2 (25 points). *Write a Malab function called* `jacobIt` *that performs Jacobi iteration. Make it so that the program gracefully deals with non-convergent sequences.*

Problem 3 (10 points). *Determine whether the following sets form subspaces of $C[-1, 1]$.*

(a). *The set of functions f in $C[-1, 1]$ such that $f(-1) = f(1)$.*

(b). *The set of even functions in $C[-1, 1]$.*

(c). *The set of continuous nondecreasing functions on $[-1, 1]$.*

(d). *The set of functions f in $C[-1, 1]$ such that $f(-1) = 0$ or $f(1) = 0$.*

Problem 4 (10 points). *Let $A \in M_n(\mathbb{R})$ be fixed. Determine which of the following are subspaces of $M_n(\mathbb{R})$.*

(a). $S_1 = \{B \in M_n(\mathbb{R}) \mid AB = BA\}$

(b). $S_2 = \{B \in M_n(\mathbb{R}) \mid AB \neq BA\}$

(c). $S_3 = \{B \in M_n(\mathbb{R}) \mid BA = 0\}$

Problem 5 (10 points). *Let $\{\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_n\}$ be a spanning set for the vector space V, and let $\mathbf{v}$ be any other vector in V. Show that $\{\mathbf{v}, \mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_n\}$ is linearly dependent.*

Problem 6 (10 points). *Let $\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_n$ be linearly independent vectors in a vector space V. Show that $\mathbf{v}_2, \ldots, \mathbf{v}_n$ cannot span V.*

Problem 7 (10 points). *Let $S = \{x, 1\}$ and $T = \{2x - 1, 2x + 1\}$ be bases for $\mathbb{R}_1[x]$.*

(a). *Find the transition matrix from T to S.*

(b). *Use your answer in part (a) to find the transition matrix from S to T.*