Homework Feedback 5

2016/11/9

Weiwei Xu

**P. 429 #5** The following linear systems Ax = b have x as the actual solution and as an approximate solution. Compute and

**Answer:** Follow the norm definition of vector and matrix to compute the result. The answers in the submitted homework report are correct.

**P. 429 #7** Show by example that defined bydoes not define a matrix norm.

**Answer:** Check whether this definition satisfies all the necessary properties of a matrix norm: such definition can not always satisfy the consistency condition

**P. 430 #13** Prove that if is a vector norm on , then matrix norm.

**Answer:** Verify that this definition satisfies all the necessary properties of a matrix norm:

1. If .

Proof. a. If A = 0, it is obvious that .

b. If we can simply choose a vector (note the 1 appears at the position corresponding to the row of A that has nonzero entries) to pick up the nonzero elements in A, then is not a zero vector, then . The contradiction shows that must be 0.

2. . It is obvious since the vector norm has the property .

3. .

Proof: Note:

We have: =

4.

Proof: Note that , since Bx is a vector.

We have: .

**P. 436 #3** Which of the matrices in Exercise 1 are convergent?

**Answer:** Compute the spectral radius of the matrices to determine whether they are convergent or not. Only c is convergent.

**Note:** usually, for a convergent matrix, its row or column sum should be less than 1. Not a strict proof, but very useful when you are checking problems of your numerical code.