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CP.2.3.3, Sauer3

Let A be the n-by-n matrix with entries

$$a_{ij} = |i - j| + 1.$$

Define $x = (1, \ldots, 1)^T$ and $b = Ax$. For $n = 100$, 200, 300, 400, and 500, use the python program from Computer Problem 2.1.1 or Numpy's `numpy.linalg.solve` command to compute `xc`, the double precision computed solution. Calculate the infinity norm of the forward error for each solution. Find the five error magnification factors of the problems $Ax = b$, and compare with the corresponding condition numbers.

Hint: Note that this $a_{ij} = |i-j|+1$ formula is the same with 0-base indexing (Python) or 1-base indexing (Sauer and Matlab). Here is a code snippet to generate A with $n = 5$.

```
n = 5
A = np.zeros( [ n, n ], dtype=float )
for i in range(0,n):
  for j in range(0,n):
      A[i,j] = abs( i - j ) + 1.
print(A)
```

```
[[1. 2. 3. 4. 5.]
 [2. 1. 2. 3. 4.]
 [3. 2. 1. 2. 3.]
 [4. 3. 2. 1. 2.]
 [5. 4. 3. 2. 1.]]
```