Week 6 Assignment
The due date for submitting this assignment has passed. Due on 2018-03-07, 23:59 IST.

Submitted assignment

1) The function \( f(x) = x^n \) is well-conditioned for

- \( x \approx 1 \)
- \( x \approx \lvert x \rvert \)
- \( x \approx -1 \)
- all values of \( x \)

No, the answer is incorrect. Score: 0
Accepted Answers: all values of \( x \)

2) The function \( f(x) = \frac{e^x}{x} \) is ill-conditioned for

- \( x \approx 1 \)
- \( \lvert x - 1 \rvert \gg 0 \)
- \( x \approx 0 \)
- all values of \( x \)

No, the answer is incorrect. Score: 0
Accepted Answers: \( \lvert x - 1 \rvert \gg 0 \)

3) Consider a machine with five decimal digit floating point rounded arithmetic consider the sequence \( \{x_n\} \) defined recursively by \( x_{n+1} = 2^{n+1} \left( \sqrt{1 + \frac{x_n}{2^n}} - 1 \right) \) for \( n = 0, 1, 2, \ldots \) with \( x_0 = 0.00001 \). Then, using a better way to avoid the cancellation error in the given iterative scheme, the value of \( x_6 \) is given by

- 0.009963
- 0.0099854
- 0.000005?
4) Consider a machine with five decimal digit floating point arithmetic consider the quadratic equation \( x^2 + 144.14x + 1.9696 = 0 \). If the exact roots are \( x_1 = -0.0136658 \) and \( x_2 = -144.1263342 \) then solving this equation by the relative error method to avoid the cancellation errors for the roots are given by

- \( 4.3949 \times 10^{-5} \), \( 1.3342 \times 10^{-3} \)
- \( 4.3949 \times 10^{-5} \), \( 1.4635 \times 10^{-3} \)
- \( 4.3949 \times 10^{-4} \), \( 1.3342 \times 10^{-3} \)
- \( 4.3949 \times 10^{-4} \), \( 1.4635 \times 10^{-3} \)

No, the answer is incorrect.
Score: 0
Accepted Answers: 
4.3949 \times 10^{-5} \), \( 1.4635 \times 10^{-3} \)

5) Consider a machine with five decimal digit floating point representation with rounded arithmetic consider the equation \( x^2 - 133.13x + 1.6969 = 0 \). If the exact roots are \( x_1 = 133.1172526 \), \( x_2 = 0.0127474 \) then solving it by a method the cancellation error in the general formula, the relative errors for the roots are given by

- \( 2.0639 \times 10^{-5} \), 0.6078
- \( 2.0639 \times 10^{-4} \), \( 3.1379 \times 10^{-3} \)
- \( 2.0639 \times 10^{-5} \), \( 3.1379 \times 10^{-5} \)
- \( 2.0639 \times 10^{-5} \), \( 3.1379 \times 10^{-4} \)

No, the answer is incorrect.
Score: 0
Accepted Answers: 
2.0639 \times 10^{-5} \), \( 3.1379 \times 10^{-5} \)

6) Consider the linear system \( Ax = b \), where \( A = \begin{pmatrix} 4 & 3 \\ 4 & 3.001 \end{pmatrix} \) and \( b = \begin{pmatrix} 8 \\ 8 \end{pmatrix} \). Using the solution of the perturbed equation \( (A + \Delta A)(x + \delta x) = b + \delta b \), where \( \Delta A = \begin{pmatrix} 0 & -0.001 \\ 0 & -0.001 \end{pmatrix} \) and \( \delta b = \begin{pmatrix} 0.001 \\ -0.001 \end{pmatrix} \), the system \( Ax = b \)

- is well conditioned
- is ill conditioned
- is neither ill conditioned nor well conditioned
- can not be solved

No, the answer is incorrect.
Score: 0
Accepted Answers: 
is ill conditioned

7) Let \( x = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \) be a given vector then

- \( \|x\|_2 = 5.4772 \)
- \( \|x\|_1 = 5 \)
- \( \|x\|_\infty = 8 \)
8) Let \( \{x^k\} \) be a sequence of vectors defined as \( \{x^k\} = \{k \text{Sin}(\frac{k}{2}), -2 + k^2 e^{-k}, \sqrt{k^2 + 1} - k\} \).

Then the limit of \( \{x^k\} \) is

- (0, -2, 1)
- (1, -2, 1)
- (1, -2, 0)
- None of these.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(1, -2, 0)

9) \( \|A\|_1 = 10 \)
\( \|B\|_1 = 15 \)
\( \|A\|_\infty = 6 \)
\( \|B\|_\infty = 15 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\( \|B\|_\infty = 15 \)

10) Let \( A_{3 \times 4} \) and \( B_{4 \times 3} \) be two matrices such that \( A^T = B \). Then

\( \|A\|_\infty = \|B\|_\infty \)
\( \|A\|_\infty = \|B\|_1 \)
\( \|A\|_1 = \|B\|_1 \)
\( \|A\|_\infty \neq \|B\|_1 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\( \|A\|_\infty = \|B\|_1 \)