Quiz 5
Math 371, Introduction to Numerical Computing
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Date: 10/04/2019

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Section #: ..... 

Question 1. [2 marks]

a) Determine the first Taylor polynomial about $(0, \pi)$ for the function $f(t, y) = \sin(t + y)$.

b) Use the Midpoint method with $h = 0.5$ to approximate the solution to the IVP

\[ y' = t \cos(y), \quad 0 \leq t \leq 1, \quad y(0) = 0. \]
Question 2. [1 mark] Use Gaussian elimination without partial pivoting to solve the system of linear equations

\[
\begin{align*}
E_1: & \quad x_1 - x_2 + x_3 = 2, \\
E_2: & \quad -2x_1 + x_2 + 3x_3 = 0, \\
E_3: & \quad x_1 - 4x_2 + 8x_3 = 1.
\end{align*}
\]
Question 3. [1 mark] Suppose we are using a decimal floating-point system with precision two. Perform Gaussian elimination with partial pivoting to solve the system of linear equations

\[
\begin{cases}
0.00001x_1 + 2x_2 = 3, & (E_1) \\
x_1 + x_2 = 4. & (E_2)
\end{cases}
\]
Question 4. [2 marks] Solve the following linear system using the \textit{LU} factorization of Doolittle’s method:

\[
\begin{align*}
    x_1 + 3x_2 &= 0, \\ 
    2x_2 + 2x_3 &= 0, \\ 
    -x_1 + 4x_2 &= 1.
\end{align*}
\]