# Math 2080: Differential Equations
# Worksheet 1.3: Approximating solutions to differential equations

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**NAME:**

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1. Consider the initial value problem $y' = t + y$, $y(0) = 1$.

   (a) When computing a solution by hand using Euler's method, it is beneficial to arrange your work in a table, as shown below where the first step is computed. Continue with Euler's method using step-size $h = 0.1$ and complete all missing entries of the table.

   | $k$ | $t_k$ | $y_k$ | $f(t_k, y_k) = t_k + y_k$ | $h$ | $f(t_k, y_k) \cdot h$ |
   |-----|-------|-------|---------------------------|-----|-----------------------|
   | 0   | 0.0   | 1.0   | 1.0                       | 0.1 | 0.1                   |
   | 1   | 0.1   | 1.1   |                           |     |                       |
   | 2   | 0.2   |       |                           |     |                       |
   | 3   | 0.3   |       |                           |     |                       |
   | 4   | 0.4   |       |                           |     |                       |
   | 5   | 0.5   |       |                           |     |                       |

   (b) The general solution of $y' = t + y$ is $y(t) = Ce^t - t - 1$. Using this, compute the actual value of $y(0.5)$. Use a calculator to see how close this is to the approximated answer you got using Euler's method.