# MATH 3430-02 QUIZ 3

Name: _____

**Approximate** $y(1)$ of the following initial value problem using Euler's Method for $n = 2$.

$$\frac{\mathrm{d}y}{\mathrm{d}t} = \frac{1}{1 + t^2 + y^2}, \quad y(0) = 0.$$

Below a table is provided to help you. *(I recommend first putting the formulae for $y_k$ and $y'_k$ as well as the values of $t_k$, $\Delta t$ in the respective entries.)*

| $k$ | $t_k$ | $y_k =$ | $y'_k =$ | $\Delta t$ (or $h$) |
|---|---|---|---|---|
| 0 | | | | |
| 1 | | | | |
| 2 | | | | |

*Ans:* $y_2 =$ _____.

Now consider the choice:

$$a = 1, \qquad b = 1,$$

and the expressions

$$M = \max_{(t,y)\in\mathcal{R}} |f(t,y)|, \qquad \alpha = \min\left\{a, \frac{b}{M}\right\}.$$

*Use this information (with suitable calculations) to explain why it is reasonable to use Euler's Method to approximate $y(1)$.* (Hint: What guarantees that a solution exists at $t = 1$ and is unique?)

*Is it reasonable to use Euler's Method to approximate $y(2019)$?* (Hint: Does $M$ depend on the choice of $a, b$? How can you choose $a, b$ to obtain a larger $\alpha$?)