

Please PRINT your name \_\_\_\_\_

**No calculators, cell phones, computers, notes, etc.**

Circle your answer. Make your work correct, complete and coherent.

The quiz is worth 5 points. The solutions will be posted on my website later today.

**Quiz 2, January 27, 2021**

Consider the Initial Value Problem  $y' = -y$ ,  $y(0) = 2$ . Use **Euler's Method** to approximate  $y(\frac{1}{2})$ . **Take the step size to be  $h = \frac{1}{4}$ .**

**ANSWER:** Let  $f(x, y) = -y$ ,  $(x_0, y_0) = (0, 2)$ ,  $x_1 = \frac{1}{4}$ , and  $x_2 = \frac{1}{2}$ . Define  $y_1$  so that the slope of the line joining  $(x_0, y_0)$  to  $(x_1, y_1)$  is  $f(x_0, y_0)$ . Define  $y_2$  so that the slope of the line joining  $(x_1, y_1)$  to  $(x_2, y_2)$  is  $f(x_1, y_1)$ . Then  $y_2$  is our approximation of  $y(\frac{1}{2})$ .

At any rate

$$\frac{y_1 - 2}{\frac{1}{4}} = \frac{y_1 - y_0}{x_1 - x_0} = f(x_0, y_0) = -2;$$

so,

$$y_1 = -\frac{1}{2} + 2 = \frac{3}{2};$$

and

$$\frac{y_2 - \frac{3}{2}}{\frac{1}{4}} = \frac{y_2 - y_1}{x_2 - x_1} = f(x_1, y_1) = -\frac{3}{2}.$$

Thus,

$$y_2 = -\frac{3}{8} + \frac{3}{2} = \frac{9}{8}.$$

Our approximation of  $y(\frac{1}{2})$  is  $y_2 = \frac{9}{8}$ .