**Benjamin Walter** **math210**

**Assignment Discrete_Functions_and_Derivatives due 11/11/2021 at 02:02pm EET**

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**Problem 1.** **(1 point)** METUNCC/Applied_Math/discrete/polynom.pg

Discretize the function $f(t) = 2 - t$ over the interval $[1, 3]$ with step-size $h = \frac{2}{3}$.

Sample points: $\mathrm{t} = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$ Function: $\mathrm{f} = \begin{bmatrix} \_\_\_\_ \\ \_\_\_ \\ \_\_\_ \\ \_\_\_ \end{bmatrix}$

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**Problem 2.** **(1 point)** METUNCC/Applied_Math/discrete/euler1.pg

Use Euler's method to approximate the solution to $y' = y - t$ , $y(-2) = -2$ on the interval $[-2, 0]$ with step-size $h = \frac{2}{3}$.

$t_0 =$ __ $y_0 =$ ____
$y_0' =$ ____

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$t_1 =$ __ $y_1 =$ ____
$y_1' =$ ____

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$t_2 =$ __ $y_2 =$ ____
$y_2' =$ ____

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$t_3 =$ __ $y_3 =$ ____

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**Problem 3.** **(1 point)** METUNCC/Applied_Math/discrete/order1-t.pg

Discretize the differential equation $y' = 2 - 2t$ , $y(0) = 0$ over the interval $[0, 1]$ with step-size $h = \frac{1}{3}$.

$$\begin{bmatrix} \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$$

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**Problem 4.** **(1 point)** METUNCC/Applied_Math/discrete/order1-yt.pg

Discretize the differential equation $y' + y = 1 - 2t$ , $y(-1) = 0$ over the interval $[-1, 2]$ with step-size $h = 1$.

$$\begin{bmatrix} \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$$

**Problem 5.** **(1 point)** METUNCC/Applied_Math/discrete/trig.pg

Discretize the function $f(t) = \cos(2t)$ over the interval $[0, \pi]$ with step-size $h = \frac{\pi}{4}$.

Sample points: $\quad t = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$ $\qquad$ Function: $\quad f = \begin{bmatrix} \_\_\_\_ \\ \_\_ \\ \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

(You may use 'sqrt' in your answer, but not 'sin' or 'cos'.)

**Problem 6.** **(1 point)** METUNCC/Applied_Math/discrete/order1-rand.pg

Discretize the differential equation $y' + 2ty = 2 - 2t$ , $y(-1) = 1$ over the interval $[-1, 2]$ with step-size $h = 1$.

$$\begin{bmatrix} \_\_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix} \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix} = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$$

*(Enter variables $y_0$, $y_1$, $y_2$, $y_3$, $y_4$, $y_5$ into webwork as* y0, y1, y2, y3, y4, y5.*)*