Benjamin Walter **math210**

Assignment Discrete_Differential_Equations due 11/17/2021 at 02:03pm EET

Problem 1. **(1 point)** METUNCC/Applied_Math/discrete/order2-easy.pg

Discretize the differential equation $y''-2y'+y=\delta\left(t+\left(\frac{5}{4}\right)\right),\ \ y(-2)=0,\ y(-1)=0$ with step-size $h=\frac{1}{4}$.

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

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

Problem 2. **(1 point)** METUNCC/Applied_Math/discrete/order2-med.pg

Discretize the differential equation $y''-y'+2y=\delta\left(t-\left(\frac{18}{5}\right)\right),\ \ y'(2)=0,\ y(4)=2$ with step-size $h=\frac{2}{5}$.

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

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

Problem 3. **(1 point)** METUNCC/Applied_Math/discrete/imp-resp_apply.pg

The differential equation $-y''=f(t),\ \ y(1)=0,\ y'(2)=0$ discretized with step-size $h=\frac{1}{5}$ has the following impulse responses.

$$\mathbf{y^{(1)}}=\frac{1}{5}\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}\qquad \mathbf{y^{(2)}}=\frac{1}{5}\begin{bmatrix} 1 \\ 2 \\ 2 \\ 2 \end{bmatrix}\qquad \mathbf{y^{(3)}}=\frac{1}{5}\begin{bmatrix} 1 \\ 2 \\ 3 \\ 3 \end{bmatrix}\qquad \mathbf{y^{(4)}}=\frac{1}{5}\begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$$

What is the discrete solution to the differential equation with $f(t)=2t+1$?

$$\mathbf{y}=\begin{bmatrix} \_\_\_\_\_ \\ \_\_\_\_\_ \\ \_\_\_\_\_ \\ \_\_\_\_\_ \end{bmatrix}$$

Problem 4. **(1 point)** METUNCC/Applied_Math/discrete/order2-xpert.pg

Discretize the differential equation $y''+8ty'+\delta\left(t-\left(\frac{1}{2}\right)\right)y=2t,\quad y'(0)=3,\ \ y'(1)=2$ with step-size $h=\frac{1}{4}$.

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

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