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import numpy as np

import matplotlib.pyplot as plt


# RC Circuit parameters

R = 1000 # Resistance in ohms

C = 1e-6 # Capacitance in farads

V_source = 10 # DC voltage in volts


# Time setup

t0 = 0

t_final = 0.01 # 10 ms

h = 0.0001 # Step size

n_steps = int((t_final - t0) / h)


# Initial condition

Vc = 0 # Initial capacitor voltage

time = [t0]

vc_values = [Vc]


# Define the differential equation:  $dV_c/dt = (V - V_c) / (RC)$ 

def dVcdt(t, Vc):

    return (V_source - Vc) / (R * C)


# Modified Euler's Method

t = t0

for _ in range(n_steps):

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```
predictor = Vc + h * dVcdt(t, Vc)
corrector = Vc + (h / 2) * (dVcdt(t, Vc) + dVcdt(t + h, predictor))
Vc = corrector
t += h
time.append(t)
vc_values.append(Vc) # Ensure every step's value is appended

# Plotting the capacitor voltage over time
plt.plot(time, vc_values, label="Modified Euler Method")
plt.xlabel("Time (s)")
plt.ylabel("Capacitor Voltage Vc (V)")
plt.title("RC Circuit Response to DC Input (Modified Euler)")
plt.grid(True)
plt.legend()
plt.show()
```