



< Previous	 ✓	 ✓	 ✓	 ✓	 ✓	 ✓	 ✓	 ✓	 ✓	 ✓	 ✓	Next >
------------	-------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------	--------

### 3.1.7 Finger Exercise: Forward Euler for a system with two states

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Finger Exercises 1 due Aug 3, 2023 05:00 IST   Completed

Problem: Taking a step of Forward Euler for a two-state system

1/1 point (graded)

M02.4

M02.7

Consider an Initial Value Problem (IVP) with two states  $\underline{u} = [v, w]$ . The governing differential equations are:

$$\frac{dv}{dt} = -100v + w + t$$

(3.5)

$$\frac{dw}{dt} = -v + 2w - t^3$$

(3.6)

where  $t$  is time. The Forward Euler method is being applied to this problem. At iteration  $n$ , the states are  $[v^n, w^n] = [0, 1]$  and the time  $t^n = 1$ . For a timestep of  $\Delta t = 0.1$ , determine the value of  $v^{n+1}$  by taking another step of the Forward Euler Method. Enter your answer for  $v^{n+1}$  with (at least) 3 significant digits.

0.2

✓ Answer: 0.2

Submit

**i** Answers are displayed within the problem

Problem: Taking a second step of Forward Euler for a two-state system

1/1 point (graded)

Now, let's take a second step of the Forward Euler method for the same problem. Specifically, determine the value of  $v^{n+2}$  by taking another step of the Forward Euler Method.

Hint: in order to find  $v^{n+2}$ , you will need the value of  $w^{n+1}$  (in addition to the value of  $v^{n+1}$  which you determined in the last question).

Enter your answer for  $v^{n+2}$  with (at least) 3 significant digits.

-1.5799999999999998

✓ Answer: -1.58

Submit

**i** Answers are displayed within the problem

**SOLUTION:** The solution will be available shortly after the due date in Section [3.2.7](#).

< Previous

Next >



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