**Harold’s DiffEq Euler’s Method Example**

26 January 2022

**Problem:**

Use Euler’s Method with h = 0.1 to approximate the solution to the following initial value problem on the interval 1 ≤ x ≤ 2.

Compare these approximations with the actual solution by graphing the polygonal-line approximation and the actual solution on the same coordinate system.

Graph the polygonal-line approximation and the actual solution on the same coordinate system.

Choose the correct graph below.

Chart, line chart

Description automatically generated Chart, line chart

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**Solution:**

Euler’s Method:

Notice that the 3rd equation above is simply the slope equation

Givens:

x0 = 1

y0 = -1

h = 0.1

**Step 0: (1, -1) = (x, y)**

**Step 1: (1.1, -0.9)**

This eliminates solutions A and D.

For A, the y value is not high enough. Also, the point (1, -1) is not on the graph.

For D, x0 should be at the bottom left corner (1,-1). It is too high.

**Step 2: (1.2, -0.8240)**

**Step 3: (1.3, -0.7538)**

**Step 4: (1.4, -0.6935)**

… Steps 5 – 9 …

**Step 9: (2.0, ?)**

From the graph below, the approximation points are ABOVE the graph y = -1/x.

Since with B the approximation points are below the actual graph, the solution must be C.

**Answer: C**

**Graph:**

Chart

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Chart

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