include your plot and describe the key features of it

As the value of P increase the step size gets smaller, but large changes seem to stop around p 0 5 or h = 0.03. See figure on next page

including the approximate slope of each line,   
Aprx Slope at x = 2 is:

Avg Slope P 1 is: -9.259563781596993

Avg Slope P 2 is: -5.762931529041609

Avg Slope P 3 is: -3.0860815534044237

Avg Slope P 4 is: -1.57933546779237

Avg Slope P 5 is: -0.7966230540812476

Avg Slope P 6 is: -0.3997717842009136

Avg Slope P 7 is: -0.20021536397539236

what you think the convergence rate is for the true relative error for each state variable, and if these results make sense to you (and why or why not).

As p increase the value of h decreases when h = 0.5^p as step size increases, we would expect the true error to decrease. In the below true error read is using p =20 for the true error value we see the expected decrease trend of true error as we get closer and closer to the value at x = 2

True error P= 1 is 0.4526909722201

True error P= 2 is 0.13462999131732234

True error P= 3 is 0.03537835014978752

True error P= 4 is 0.008999612594177808

True error P= 5 is 0.0022655261866222354

True error P= 6 is 0.0005680997317338843

True error P= 7 is 0.0001422250363449784

Chart, histogram

Description automatically generated