Paul Buttles

08/22/2020

PHYS 331, HW1

1b.) All mesh sizes successfully graph, but the smoothness of the curves is problematic for the higher mesh sizes. For example, a mesh size of 1 is too large to show the smooth transition along the curve, particularly from x=-2 to x=-1, and x=0 to x=1.

4a.) If the error case delta = 0 were not checked, it would return the error, “ZeroDivisionError: division by zero.” This is because the functions compute 1 = delta * 1/delta, and thus delta = 0 requires division by 0 which is not permitted.

4b.) For a given delta, the accuracy of the computation increases as the precision of the data type increases. In general, for a given data type, the accuracy of the computation decreases as delta decreases in value (and hence increases in size as more digits are used). For 16-bit specifically, the accuracy gradually decreases for 0.1, 0.01, and 0.001, then quickly drops off after 0.0001. For 32-bit and 64-bit, there is a gradual decline in accuracy but no sharp drop off. The value of 1 is consistently undershot by 16-bit, slightly more frequently overshot by 32-bit, and equally likely to be overshot and undershot by 64-bit computation.

4c.) Values of 10^-8 and smaller rounds to zero at 16-bit precision and thus returns an error due to division by zero. Values of 10^-46 and smaller rounds to zero at 32-bit precision and thus returns an error due to division by zero. Values of 10^-309 and smaller yields the error “OverflowError: cannot convert float infinity to integer” at 64-bit precision, which implies division by zero, whereas at values of 10^-324 and smaller, it is explicitly stated that this is rounded to and divided by zero.