

HornersMethod

November 13, 2019

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In [ ]: ##Using Horner's method to evaluate  $x^3 + 2x^2 + 10x - 2$ 

import math as math
import matplotlib.pyplot as plt
import numpy as np

p = np.poly1d([1, 2, 10, -2])
err = 0.5 * math.pow(10, -5)
z = 2
a3 = p[3]
bi = 0
ci = 0
diff = 5
estimates = [2]

count = 0
while abs(diff) > err or count == 10:
    count+1
    #horner's method to get f(x), f'(x) given root of z.
    for i in reversed(range(4)):
        b = p[i] + (z*bi)
        bi = b
        if (i > 0): #Stop calculating at c1
            c = b + (z*ci)
            ci = c
        print("z = ", z, " i = ", i, " b = ", b, " c = ", c)

    z = z - (b / c) #root = p - f(p) / f'(p). Core of newton's method
    estimates.append(z) #add the root to list
    diff = (estimates[len(estimates)-1] - estimates[len(estimates)-2])
    print("z: ", z, " diff: ", diff)

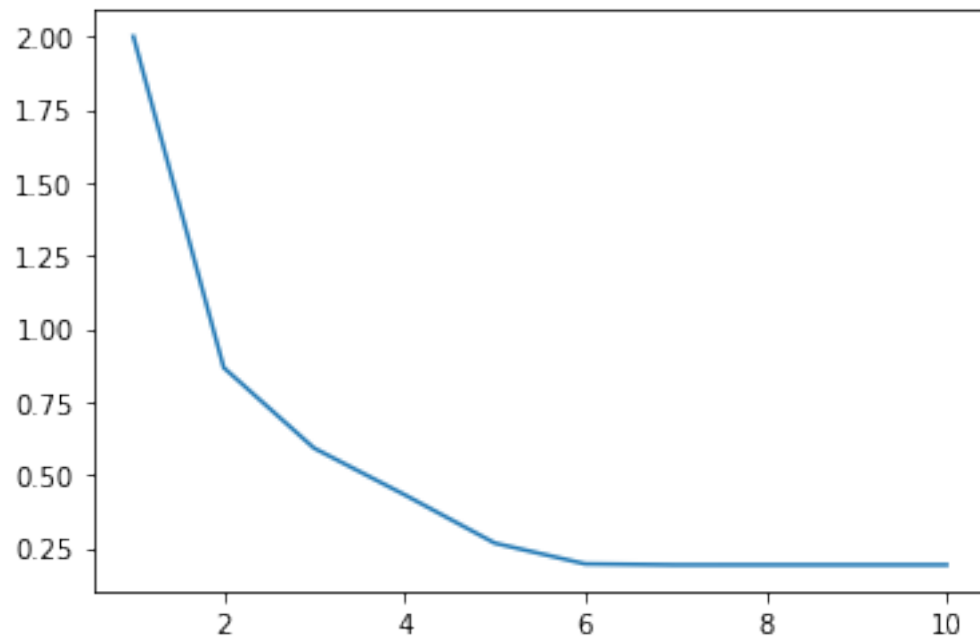
counts = [1,2,3,4,5,6,7,8,9,10]
plt.plot(counts, estimates)
plt.show(block=False)
input('press <ENTER> to continue')

z = 2 i = 3 b = 1 c = 1
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z = 2 i = 2 b = 4 c = 6
z = 2 i = 1 b = 18 c = 30
z = 2 i = 0 b = 34 c = 30
z: 0.866666666667 diff: -1.13333333333
z = 0.866666666667 i = 3 b = 30.4666666667 c = 56.4666666667
z = 0.866666666667 i = 2 b = 28.4044444444 c = 77.3422222222
z = 0.866666666667 i = 1 b = 34.6171851852 c = 101.6471111111
z = 0.866666666667 i = 0 b = 28.0015604938 c = 101.6471111111
z: 0.59118849333 diff: -0.275478173337
z = 0.59118849333 i = 3 b = 17.5542003592 c = 77.6468028284
z = 0.59118849333 i = 2 b = 12.377841262 c = 58.281737638
z = 0.59118849333 i = 1 b = 17.3176373264 c = 51.7731299892
z = 0.59118849333 i = 0 b = 8.23798791901 c = 51.7731299892
z: 0.432071439354 diff: -0.159117053976
z = 0.432071439354 i = 3 b = 4.55939929755 c = 26.9290900919
z = 0.432071439354 i = 2 b = 3.96998621708 c = 15.6052769336
z = 0.432071439354 i = 1 b = 11.715317659 c = 18.4579121252
z = 0.432071439354 i = 0 b = 3.06185416343 c = 18.4579121252
z: 0.266188421673 diff: -0.165883017681
z = 0.266188421673 i = 3 b = 1.81503012716 c = 6.72831262315
z = 0.266188421673 i = 2 b = 2.48314000484 c = 4.27413892251
z = 0.266188421673 i = 1 b = 10.6609831187 c = 11.7987094125
z = 0.266188421673 i = 0 b = 0.837830269843 c = 11.7987094125
z: 0.195178089902 diff: -0.0710103317704
z = 0.195178089902 i = 3 b = 1.16352611173 c = 3.46637567817
z = 0.195178089902 i = 2 b = 2.22709480404 c = 2.90365538779
z = 0.195178089902 i = 1 b = 10.4346801099 c = 11.0014100222
z = 0.195178089902 i = 0 b = 0.0366209325903 c = 11.0014100222
z: 0.191849340904 diff: -0.00332874899821
z = 0.191849340904 i = 3 b = 1.00702570178 c = 3.11763896356
z = 0.191849340904 i = 2 b = 2.19319721716 c = 2.7913141975
z = 0.191849340904 i = 1 b = 10.4207634406 c = 10.9562752296
z = 0.191849340904 i = 0 b = -0.000783402204659 c = 10.9562752296
z: 0.191920843508 diff: 7.15026035984e-05
z = 0.191920843508 i = 3 b = 0.999849648788 c = 3.10258723256
z = 0.191920843508 i = 2 b = 2.19189198798 c = 2.78734314671
z = 0.191920843508 i = 1 b = 10.4206697592 c = 10.9556190071
z = 0.191920843508 i = 0 b = -5.62698956286e-05 c = 10.9556190071
z: 0.191925979675 diff: 5.13616762249e-06
z = 0.191925979675 i = 3 b = 0.999989200345 c = 3.10265711123
z = 0.191925979675 i = 2 b = 2.19192390694 c = 2.78740441261
z = 0.191925979675 i = 1 b = 10.4206871432 c = 10.9556624659
z = 0.191925979675 i = 0 b = 5.88852844263e-07 c = 10.9556624659
z: 0.191925925927 diff: -5.37487209185e-08

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