Newton's Method

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

For the given function f and initial approximation x_0, use Newton's method to approximate a root of f. Stop calculating approximations when two successive approximations agree to five digits to the right of the decimal point after rounding. Show your work by making a table.

1) $f(x) = x^2 - 4 \cos x$; $x_0 = -3$ 1) _____

A) $x \approx -1.20154$

n	x_n
0	–3
1	–1.02574
2	–1.21246
3	–1.20157
4	–1.20154
5	–1.20154

B) $x \approx -1.20234$

n	x_n
0	–3
1	–0.25671
2	–2.74390
3	–1.14992
4	–1.20234
5	–1.20234

C) $x \approx 1.15922$

n	x_n
0	–3
1	–2.49348
2	–1.70660
3	0.42900
4	1.15922
5	1.15922

D) $x \approx -2.89037$

n	x_n
0	–3
1	–0.61569
2	2.06013
3	–8.32541
4	–2.89037
5	–2.89037

2) $f(x) = x^2 - 3\sqrt{x} - 1$; $x_0 = 4$ 2) _____

A) $x \approx 2.37233$

n	x_n
0	4
1	2.84800
2	2.46755
3	2.38482
4	2.37233
5	2.37233

B) $x \approx 2.37271$

n	x_n
0	4
1	2.83871
2	2.46631
3	2.38583
4	2.37271
5	2.37271

C) $x \approx 2.37041$

n	x_n
0	4
1	2.75862
2	2.40595
3	2.37077
4	2.37041
5	2.37041

D) $x \approx 2.40192$

n	x_n
0	4
1	2.20000
2	2.48031
3	2.31588
4	2.40192
5	2.40192

Use a calculator to compute the first 10 iterations of Newton's method when applied to the function with the given initial approximation. Make a table for the values. Round to six decimal places.

3) $f(x) = x^3 + x - 9$; $x_0 = 1$ 3) _____

A)

k	x_k
0	1.000000
1	2.500000
2	2.149632
3	1.987412
4	1.883214
5	1.875632
6	1.875632
7	1.875632
8	1.875632
9	1.875632
10	1.875632

B)

k	x_k
0	1.000000
1	2.750000
2	2.135884
3	1.939793
4	1.920357
5	1.920175
6	1.920175
7	1.920175
8	1.920175
9	1.920175
10	1.920175

C)

k	x_k
0	1.000000
1	2.750000
2	2.006982
3	1.999364
4	1.999936
5	1.999994
6	1.999999
7	1.999999
8	1.999999
9	1.999999
10	1.999999

D)

k	x_k
0	1.000000
1	2.250000
2	2.135884
3	2.939793
4	2.920357
5	2.920105
6	2.920105
7	2.920105
8	2.920105
9	2.920105
10	2.920105

4) $f(x) = 3x - \cos x$; $x_0 = 1$ 4) _____

A)

k	x_k
0	1.000000
1	0.559699
2	0.517112
3	0.516751
4	0.516751
5	0.516751
6	0.516751
7	0.516751
8	0.516751
9	0.516751
10	0.516751

B)

k	x_k
0	1.000000
1	0.469821
2	0.421897
3	0.396478
4	0.374126
5	0.355412
6	0.355411
7	0.355411
8	0.355411
9	0.355411
10	0.355411

C)

k	x_k
0	1.000000
1	1.559699
2	1.517112
3	1.516751
4	1.516751
5	1.516751
6	1.516751
7	1.516751
8	1.516751
9	1.516751
10	1.516751

D)

k	x_k
0	1.000000
1	0.359699
2	0.317010
3	0.316751
4	0.316751
5	0.316751
6	0.316751
7	0.316751
8	0.316751
9	0.316751
10	0.316751

5) $f(x) = 1 - \ln(x + 8)$; $x_0 = -6$ 5) _____

A)

k	x_k
0	−6.000000
1	−6.886294
2	−6.783756
3	−6.781719
4	−6.781718
5	−6.781718
6	−6.781718
7	−6.781718
8	−6.781718
9	−6.781718
10	−6.781718

B)

k	x_k
0	−6.000000
1	−5.963274
2	−5.941212
3	−5.896325
4	−5.896456
5	−5.896477
6	−5.896478
7	−5.896478
8	−5.896478
9	−5.896478
10	−5.896478

C)

k	x_k
0	−6.000000
1	−5.963258
2	−5.941253
3	−5.896325
4	−5.896322
5	−5.896322
6	−5.896322
7	−5.896322
8	−5.896322
9	−5.896322
10	−5.896322

D)

k	x_k
0	−6.000000
1	−5.386294
2	−5.283756
3	−5.281719
4	−5.281718
5	−5.281718
6	−5.281718
7	−5.281718
8	−5.281718
9	−5.281718
10	−5.281718

6) $f(x) = e^x + 2x + 4$; $x_0 = 0$ 6) _____

A)

k	x_k
0	0.000000
1	–2.147125
2	–2.398741
3	–2.539566
4	–2.539604
5	–2.539604
6	–2.539604
7	–2.539604
8	–2.539604
9	–2.539604
10	–2.539604

B)

k	x_k
0	0.000000
1	–2.000000
2	–2.361689
3	–2.369454
4	–2.369455
5	–2.369455
6	–2.369455
7	–2.369455
8	–2.369455
9	–2.369455
10	–2.369455

C)

k	x_k
0	0.000000
1	–1.666667
2	–2.057526
3	–2.063503
4	–2.063504
5	–2.063504
6	–2.063504
7	–2.063504
8	–2.063504
9	–2.063504
10	–2.063504

D)

k	x_k
0	0.000000
1	–2.000000
2	–2.361689
3	–2.369454
4	–2.369566
5	–2.369566
6	–2.369566
7	–2.369566
8	–2.369566
9	–2.369566
10	–2.369566

Answer Key
Testname: NEWTON'S METHOD

1) A
2) C
3) B
4) D
5) D
6) C