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Bisection Method and Falsi Regulation Method to Determine The Roots of Polynomial Equations

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***Abstract**. Some simple polynomial equations can be solved by the remainder theorem, so there is no need for numerical methods to solve them, because the roots of equations are very easy to do using analytical methods, while there are some polynomial equations that are difficult and complex to find roots using analytical methods.. In this literature review, researchers will use the bisection method and the false rule to find the roots of polynomial equations. Based on the steps or sequence of calculation of the polynomial roots of* $x^3 + 4x^2 - 10$*, using the bisection method, the author states that from the first step to the eleventh step, if the calculation continues then in the second step f(a)*f(c)>0 or away from zero as shown in table 1 above. The author states that if the twelfth step continues, then f(a)*f(c) will approach zero and it can be seen that there are looping process approaches resulting from f(a)*f(c). This research study concludes that the roots of the polynomial of* $x^3 + 4x^2 - 10 = 0$*, using the bisection method are 1.36474675. Based on the steps or sequence of calculating the roots of the polynomial of* $x^3 + 4x^2 - 10 = 0$ *on, using the false position method (false rule), the author states that from the first step to the 366th step it turns out that f(c)=0.003195 when c=1,365423447. Thus the polynomial roots of* $x^3 + 4x^2 - 10 = 0$ *using the false position method (regulation false) are 1.365423447.*

***Keywords**: Roots of polynomial equations.*

I. INTRODUCTION

Bisection method is the easiest method using an interval which is divided into two or half. The root is known to be lying in either one of these interval. In practical problem of finding roots of a nonlinear equation where good initial estimates of the roots are known, there are several of computationally efficient algorithms available which can be programmed for using on a computer. However, in which earlier information on the location of the root of difficult problems are poor because the methods often fail to converge. It is known that the regular method is false with the equation $y = f(x)$. The root of $f(x) = 0$ is found by the x-coordinate of the point P which is the intersection of the curve $y = f(x)$. The iteration of the falsi regulation method is the same as the bisection method, in this case both looking for the value of c. The value of c is used for the next iteration by paying attention to the specified interval width. Like the divide by two method, this method works iteratively by updating the range. It is known that the regular method is false with the equation $y = f(x)$. The root of $f(x) = 0$ is found by the x-coordinate of the point P which is the intersection of the curve $y = f(x)$. The iteration of the regular false method is the same as the bisection method, in this case both looking for the value of c. The value of c is used for the next iteration by paying attention to the specified interval width

II. THEORETICAL BASIS

The division of this interval [a,b], into two continue until the root is found, up to certain degree of accuracy. Method has opposite signs at both edges of the intervals where $(a)(b) < 0$ [1]. Then, it is known that $f(x)$ has at least one root in the interval [a,b]. The existing method proceeds and continue its iteration until it converges to a point within the tolerance range and finds the value of x such that $(x) = 0$ or approximately 0 [2]. A better approximation is obtained if a point $(c, 0)$ is found where the secant line L joining the points $(a, f(a))$ and $(b, f(b))$ crosses the x −axis [3]. The main advantage of Bisection method is that the behaviour itself is always convergent since the method brackets the root much more quickly than the incremental search method does. Hence, Bisection method is easy to use, apply and has wide range of applications in other developments. However, the division of the interval into two section leads to slow convergence of Bisection method. Hence, a new method is proposed named as n-th section method. This methods are compared with the original Bisection method based on number iterations, CPU times and accuracy. The bisection algorithm is the most primitive but robust for finding a real root because it is always converges to the root [4]. The bisection method or the dividing method divides the interval between x_1 and x_2 in a function $f(x)$ where it is estimated that there is a root, into 2 subintervals of equal size. The root is searched in one of the subintervals and the interval cannot be too wide. There are two possibilities, namely the value of the root is between $x_0 = 2$ and x_0 or the value of the root is between x_0 and b. In its application, the researcher will carry out an iterative process using the following steps: determine the value of *c = (a+b)/2*, the value of c = b when *f(a).f(c)* is less than zero and the value of *c = a* at when *f(a).f(c)* is greater than zero. The iteration will stop when a = c and/or the value of a approaches *c* while the other conditions *b=c* and/or the value of *b* approaches *c*.

In practical problem of finding roots of a nonlinear equation where good initial estimates of the roots are known, there are several of computationally efficient algorithms available which can be programmed for using on a computer. However, in which earlier information on the location of the root of difficult problems are poor because the methods often fail to converge. So, this paper is an attempt to investigate for a method which based on classic Regula Falsi method. We consider the nonlinear equation [5]

$$f(x) = 0 \tag{1}$$

where *f* is a continuously differentiable on [a, b] $\subset \Re$ and has at least one root, *r* , in [a , b]. The well-known quadratically convergent Newton method and its variants are iterative formula generally used for finding a root of (1) [5]. But, these methods may fail to converge in case the initial point is far from root or the derivative vanishes in the vicinity of the root. The false regulation method is a method of finding the root of the equation by utilizing the slope and the difference in height of two range boundary points. Like the divide by two method, this method works iteratively by updating the range. It is known that the regular method is false with the equation *y = f(x)*. The root of *f(x) = 0* is found by the x-coordinate of the point *P* which is the intersection of the curve *y = f(x)*. The iteration of the regular false method is the same as the bisection method, in this case both looking for the value of *c*. The value of *c* is used for the next iteration by paying attention to the specified interval width.

III. RESEARCH METHODS

The data collection method is in the form of taking theories and examples of questions related to finding the roots of polynomial equations using the bisection method and the false position method (falsi regulation).

3.1 Bisection Method

The steps for solving the equation using the bisection method are as follows

Step 1: Select the estimated value of a as the lower limit of the interval and the estimated value of b as the upper limit of the interval. If the following conditions are met: f(a) x f(b) < 0 then there is a root in the interval, then go to step 2.

f(a) x f(b) > 0 ; then there is no root in the interval. Slide the interval position.

f(a) x f(b) = 0 ; then a and b, one of which is a root.

Step 2: The first root estimate is c where, c = (a + b)/2

Step 3:Evaluate the presence of a root, whether in the first subinterval (between a and c) or in the second subinterval (between c and b). If obtained:

f(a) x f(c) < 0 ; root is in the first subinterval, then b = c. then go to step 4.

f(a) x f(c) > 0 ; root is in the second subinterval, then a = c. Next to step 4.

f(a) x f(c) = 0 ; c is the root.

Step 4:Go back to step 2 and process up to step 3.

3.2 Falsi Regulation Method

The Divide Method is easy but not efficient. To get results that are close to the exact value, a long iteration step is needed. The Falsi Regulation method can make up for that shortcoming. The Falsi Regulation method is based on interpolation between two values of a function that have opposite signs.

The steps taken in solving the equation using the Falsi Regulation method are as follows: [6]

a. Compute the function on the same interval from x to the change in sign of the functions f(xn) and $f(x_{n+1})$, i.e. $f(x_n).\, f(x_{n+1}) < 0$
b. Find the value of x* with the equation:

$$x^* = x_{n-1} - \frac{f(x_{n-1})}{f(x_{n-1}) - f(x_n)}(x_{n-1} - x_n)$$

or

determine value $c = b - \frac{f(b)(b-a)}{f(b)-f(a}$.

The thing to note is the interpolation of the value of c until it is close to zero (0). This value is used to calculate the value of f(x*), which is then used again for linear interpolation with values of $f(x_n)$ or $f(x_{n-1})$ such that the two functions have different signs. The procedure is repeated until the value of $f(x^*)$ approaches zero.

IV. RESULTS AND DISCUSSION

The bisection method or the dividing method divides the interval (between x_1 and x_2 in a function $f(x)$ where it is estimated that there is a root, into 2 subintervals of equal size. The root is searched in one of the subintervals and the interval cannot be too wide. The Bisection method is basically a technical method known as "Half". The bisect method states that if the function $f(x)$ is continuous in the interval (a, b), and $f(a)$ and $f(b)$ are opposite in sign, then $f(\alpha) = 0$ such that $a < \alpha < b$. With the Divide by Two method, the value of is first approximated by selecting x_0 which is defined as $x_0 = \frac{a+b}{2}$ if $f(x_0) = 0$ or $f(x_0)$ is "close" to the value 0 for a given tolerance value then x_0 is the root of $f(x_0) = 0$ [7] .

4.1 Bisection Method

Solving the roots of the polynomial roots of $x^3 + 4x^2 - 10$ using the bisection method as the

solution is shown in table 1 below,

Table 1. Roots of polynomials of $x^3 + 4x^2 - 10$ using the bisection method

N	A	B	c = (a+b)/2	f(a)	f(b)	f(c)	f(a)*f(b)	f(a)*f(c)	f(b)*f(c)
1	1	2	1,5	-5	14	2,375	-70	-11,875	33,25
2	1	1,5	1,25	-5	2,375	-1,796875	-11,875	8,984375	-4,2675781
3	1,25	1,5	1,375	-1,796875	2,375	0,162109375	-4,2675781	-0,291290283	0,38500977
4	1,25	1,375	1,3125	-1,796875	0,1621093	-0,848388672	-0,2912903	1,524448395	-0,1375318
5	1,3125	1,375	1,34375	-0,8483887	0,1621093	-0,350982666	-0,1375318	0,297769718	-0,0568976
6	1,34375	1,375	1,359375	-0,3509827	0,1621093	-0,096408844	-0,0568976	0,033837833	-0,0156288
7	1,359375	1,375	1,3671875	-0,0964088	0,1621093	0,032355785	-0,0156288	-0,003119384	0,00524518
8	1,359375	1,367188	1,3632815	-0,0964088	0,03236405	-0,03214585	-0,0031202	0,003099144	-0,0010404
9	1,363282	1,367188	1,365235	-0,0321376	0,032364058	8,23457E-05	-0,0010401	-2,64639E-06	2,665E-06
10	1,363282	1,365235	1,3642585	-0,0321376	8,23457E-05	-0,016035349	-2,646E-06	0,000515338	-1,32E-06
11	1,3642585	1,365235	1,36474675	-0,0160353	8,23457E-05	-0,007978431	-1,32E-06	0,000127937	-6,57E-07
12	1,36474675	1,365235	1,364990875	-0,0079784	8,23457E-05	-0,003948525	-6,57E-07	3,1503E-05	-3,251E-07
13	1,364990875	1,365235	1,365112938	-0,0039485	8,23457E-05	-0,00193321	-3,251E-07	7,63333E-06	-1,592E-07
14	1,365112938	1,3635235	1,364318219	-0,0019332	-0,028156766	-0,015050095	5,4433E-05	2,90949E-05	0,00042376
15	1,364318219	1,3635235	1,36392086	-0,0150501	-0,028156766	-0,021604708	0,00042376	0,000325153	0,00060832
16	1,36392086	1,3635235	1,36372218	-0,0216047	-0,028156766	-0,024881052	0,00060832	0,000537548	0,00070057
17	1,36372218	1,3635235	1,36362284	-0,0248811	-0,028156766	-0,026518989	0,00070057	0,00065982	0,00074669
18	1,36362284	1,3635235	1,36357317	-0,026519	-0,028156766	-0,027337897	0,00074669	0,000724973	0,00076975
19	1,36357317	1,3635235	1,363548335	-0,0273379	-0,028156766	-0,027747337	0,00076975	0,000758554	0,00078128
20	1,363548335	1,3635235	1,363535918	-0,0277473	-0,028156766	-0,027952052	0,00078128	0,000775595	0,00078704
21	1,363535918	1,3635235	1,363529709	-0,027952	-0,028156766	-0,028054405	0,00078704	0,000784178	0,00078992
22	1,363529709	1,3635235	1,363526605	-0,0280544	-0,028156766	-0,028105586	0,00078992	0,000788485	0,00079136
23	1,363526605	1,3635235	1,363525053	-0,0281056	-0,028156766	-0,028131172	0,00079136	0,000790643	0,00079208
24	1,363525053	1,3635235	1,363524277	-0,0281312	-0,028156766	-0,028143965	0,00079208	0,000791722	0,00079244

25	1,363524277	1,3635235	1,363523889	-0,028144	-0,028156766	-0,028150361	0,00079244	0,000792263	0,00079262
26	1,363523889	1,3635235	1,363523695	-0,0281504	-0,028156766	-0,028153559	0,00079262	0,000792533	0,00079271
27	1,363523695	1,3635235	1,363523598	-0,0281536	-0,028156766	-0,028155158	0,00079271	0,000792668	0,00079276
28	1,363523598	1,3635235	1,363523549	-0,0281552	-0,028156766	-0,028155958	0,00079276	0,000792735	0,00079278
29	1,363523549	1,3635235	1,363523525	-0,028156	-0,028156766	-0,028156362	0,00079278	0,000792769	0,00079279
30	1,363523525	1,3635235	1,363523513	-0,0281564	-0,028156766	-0,02815656	0,00079279	0,000792786	0,0007928
31	1,363523513	1,3635235	1,363523507	-0,0281566	-0,028156766	-0,028156659	0,0007928	0,000792794	0,0007928
32	1,363523507	1,3635235	1,363523504	-0,0281567	-0,028156766	-0,028156708	0,0007928	0,000792799	0,0007928
33	1,363523504	1,3635235	1,363523502	-0,0281567	-0,028156766	-0,028156733	0,0007928	0,000792801	0,0007928
34	1,363523502	1,3635235	1,363523501	-0,0281567	-0,028156766	-0,028156749	0,0007928	0,000792802	0,0007928
35	1,363523501	1,3635235	1,363523501	-0,0281567	-0,028156766	-0,028156758	0,0007928	0,000792803	0,0007928

Based on the steps or sequence of calculations, the roots of the polynomial $x^3 + 4x^2 - 10 = 0$ are completely shown in table 1. By using the bisection method to find the roots of solving polynomial equations. The result of the above calculation states that from the first step to the thirty-fifth step there is a root of solution. In its application, the researcher will carry out an iterative process using the following steps: determine the value of c = (a+b)/2, the value of c = b when f(a).f(c) is less than zero and the value of c = a at when f(a).f(c) is greater than zero. The iteration will stop when c = a and or the value of c approaches a while the other conditions c=b and or the value of c approaches b. Based on the rules of finding the roots of polynomials using the bisection method, it will be achieved if f(a) x f(c) = 0 ; c is the root. So the value of c when f(a) x f(c) approaches zero is the root of the solution. Another rule is when a = c then f(a) x f(c)>0. In the above calculation, the writer concludes that the polynomial roots of $x^3 + 4x^2 - 10 = 0$, using the bisection method are 1.363523501. The value of c is the solution to the root of the polynomial.

4.2 Falsi Regulation Method

The Falsi Regulation method is based on interpolation between two values of a function that have opposite signs. The steps taken in solving the equation using the Falsi Regulation method are as follows:

1. Compute the function on the same interval from x to the change in sign of the functions $f(x_n)$ and $f(x_{n-1})$ that is $f(x_n)f(x_{n-1}) < 0$
2. Find the value of x^* with the equation:

$$x^* = x_{n-1} - \frac{f(x_{n-1})}{f(x_{n-1}) - f(x_n)}(x_{n-1} - x_n)$$

3. This value is used to calculate the value of $f(x^*)$,, which is then used again for linear interpolation with the value of $f(x_n)$ or $f(x_{n-1})$ so that the two functions have different signs.
4. The procedure is repeated again until the value of f (x*) is close to zero

Table 2. Roots of polynomials of $x^3 + 4x^2 - 10$ using the false position method (false rule)

Iteration	a	B	c	$f(a)$	$f(b)$	$f(c)$	$b-c$	$b-a$	a_2-a_1
1	1	2	1,263157895	-5	14	-1,60227	0,736842	1	
2	1,001	2	1,263468052	-4,98899	14	-1,59765	0,736532	0,999	0,001
3	1,002	2	1,263778026	-4,97797	14	-1,59304	0,736222	0,998	0,001
4	1,003	2	1,264087817	-4,96694	14	-1,58842	0,735912	0,997	0,001
5	1,004	2	1,264397424	-4,95589	14	-1,5838	0,735603	0,996	0,001
6	1,005	2	1,264706848	-4,94482	14	-1,57919	0,735293	0,995	0,001
7	1,006	2	1,265016089	-4,93375	14	-1,57458	0,734984	0,994	0,001
8	1,007	2	1,265325147	-4,92266	14	-1,56996	0,734675	0,993	0,001
9	1,008	2	1,265634022	-4,91155	14	-1,56535	0,734366	0,992	0,001
10	1,009	2	1,265942715	-4,90043	14	-1,56074	0,734057	0,991	0,001
11	1,01	2	1,266251225	-4,8893	14	-1,55613	0,733749	0,99	0,001
12	1,011	2	1,266559553	-4,87815	14	-1,55153	0,73344	0,989	0,001
13	1,012	2	1,266867699	-4,86699	14	-1,54692	0,733132	0,988	0,001
14	1,013	2	1,267175662	-4,85581	14	-1,54232	0,732824	0,987	0,001
15	1,014	2	1,267483444	-4,84463	14	-1,53771	0,732517	0,986	0,001
16	1,015	2	1,267791043	-4,83342	14	-1,53311	0,732209	0,985	0,001
17	1,016	2	1,268098461	-4,8222	14	-1,52851	0,731902	0,984	0,001
18	1,017	2	1,268405698	-4,81097	14	-1,52391	0,731594	0,983	0,001
19	1,018	2	1,268712753	-4,79973	14	-1,51931	0,731287	0,982	0,001
20	1,019	2	1,269019626	-4,78847	14	-1,51471	0,73098	0,981	0,001
21	1,02	2	1,269326319	-4,77719	14	-1,51012	0,730674	0,98	0,001
22	1,021	2	1,26963283	-4,7659	14	-1,50552	0,730367	0,979	0,001
23	1,022	2	1,269939161	-4,7546	14	-1,50093	0,730061	0,978	0,001
24	1,023	2	1,270245311	-4,74328	14	-1,49634	0,729755	0,977	0,001
25	1,024	2	1,27055128	-4,73195	14	-1,49175	0,729449	0,976	0,001
26	1,025	2	1,270857068	-4,72061	14	-1,48716	0,729143	0,975	0,001
27	1,026	2	1,271162677	-4,70925	14	-1,48257	0,728837	0,974	0,001
28	1,027	2	1,271468105	-4,69788	14	-1,47798	0,728532	0,973	0,001
29	1,028	2	1,271773353	-4,68649	14	-1,47339	0,728227	0,972	0,001
30	1,029	2	1,27207842	-4,67509	14	-1,46881	0,727922	0,971	0,001
31	1,03	2	1,272383308	-4,66367	14	-1,46423	0,727617	0,97	0,001
32	1,031	2	1,272688017	-4,65224	14	-1,45964	0,727312	0,969	0,001
33	1,032	2	1,272992545	-4,6408	14	-1,45506	0,727007	0,968	0,001
34	1,033	2	1,273296895	-4,62934	14	-1,45048	0,726703	0,967	0,001
35	1,034	2	1,273601065	-4,61787	14	-1,4459	0,726399	0,966	0,001
36	1,035	2	1,273905055	-4,60638	14	-1,44133	0,726095	0,965	0,001
37	1,036	2	1,274208867	-4,59488	14	-1,43675	0,725791	0,964	0,001
38	1,037	2	1,2745125	-4,58337	14	-1,43218	0,725488	0,963	0,001
39	1,038	2	1,274815953	-4,57184	14	-1,4276	0,725184	0,962	0,001
40	1,039	2	1,275119229	-4,56029	14	-1,42303	0,724881	0,961	0,001
41	1,04	2	1,275422325	-4,54874	14	-1,41846	0,724578	0,96	0,001
42	1,041	2	1,275725243	-4,53716	14	-1,41389	0,724275	0,959	0,001
43	1,042	2	1,276027983	-4,52558	14	-1,40932	0,723972	0,958	0,001
44	1,043	2	1,276330545	-4,51398	14	-1,40475	0,723669	0,957	0,001

45	1,044	2	1,276632929	-4,50236	14	-1,40019	0,723367	0,956	0,001
46	1,045	2	1,276935135	-4,49073	14	-1,39562	0,723065	0,955	0,001
47	1,046	2	1,277237163	-4,47909	14	-1,39106	0,722763	0,954	0,001
48	1,047	2	1,277539013	-4,46743	14	-1,3865	0,722461	0,953	0,001
49	1,048	2	1,277840686	-4,45576	14	-1,38194	0,722159	0,952	0,001
50	1,049	2	1,278142181	-4,44408	14	-1,37738	0,721858	0,951	0,001
51	1,05	2	1,2784435	-4,43238	14	-1,37282	0,721557	0,95	0,001
52	1,051	2	1,278744641	-4,42066	14	-1,36826	0,721255	0,949	0,001
53	1,052	2	1,279045605	-4,40893	14	-1,3637	0,720954	0,948	0,001
54	1,053	2	1,279346392	-4,39719	14	-1,35915	0,720654	0,947	0,001
55	1,054	2	1,279647002	-4,38543	14	-1,3546	0,720353	0,946	0,001
56	1,055	2	1,279947436	-4,37366	14	-1,35004	0,720053	0,945	0,001
57	1,056	2	1,280247694	-4,36187	14	-1,34549	0,719752	0,944	0,001
58	1,057	2	1,280547774	-4,35007	14	-1,34094	0,719452	0,943	0,001
59	1,058	2	1,280847679	-4,33826	14	-1,3364	0,719152	0,942	0,001
60	1,059	2	1,281147408	-4,32643	14	-1,33185	0,718853	0,941	0,001
61	1,06	2	1,281446961	-4,31458	14	-1,3273	0,718553	0,94	0,001
62	1,061	2	1,281746337	-4,30273	14	-1,32276	0,718254	0,939	0,001
63	1,062	2	1,282045538	-4,29085	14	-1,31821	0,717954	0,938	0,001
64	1,063	2	1,282344564	-4,27897	14	-1,31367	0,717655	0,937	0,001
65	1,064	2	1,282643414	-4,26707	14	-1,30913	0,717357	0,936	0,001
66	1,065	2	1,282942089	-4,25515	14	-1,30459	0,717058	0,935	0,001
67	1,066	2	1,283240588	-4,24322	14	-1,30005	0,716759	0,934	0,001
68	1,067	2	1,283538912	-4,23128	14	-1,29552	0,716461	0,933	0,001
69	1,068	2	1,283837062	-4,21932	14	-1,29098	0,716163	0,932	0,001
70	1,069	2	1,284135036	-4,20734	14	-1,28645	0,715865	0,931	0,001
71	1,07	2	1,284432836	-4,19536	14	-1,28191	0,715567	0,93	0,001
72	1,071	2	1,284730462	-4,18336	14	-1,27738	0,71527	0,929	0,001
73	1,072	2	1,285027913	-4,17134	14	-1,27285	0,714972	0,928	0,001
74	1,073	2	1,285325189	-4,15931	14	-1,26832	0,714675	0,927	0,001
75	1,074	2	1,285622291	-4,14726	14	-1,26379	0,714378	0,926	0,001
76	1,075	2	1,28591922	-4,1352	14	-1,25927	0,714081	0,925	0,001
77	1,076	2	1,286215974	-4,12313	14	-1,25474	0,713784	0,924	0,001
78	1,077	2	1,286512554	-4,11104	14	-1,25022	0,713487	0,923	0,001
79	1,078	2	1,286808961	-4,09894	14	-1,24569	0,713191	0,922	0,001
80	1,079	2	1,287105194	-4,08682	14	-1,24117	0,712895	0,921	0,001
81	1,08	2	1,287401254	-4,07469	14	-1,23665	0,712599	0,92	0,001
82	1,081	2	1,287697141	-4,06254	14	-1,23213	0,712303	0,919	0,001
83	1,082	2	1,287992854	-4,05038	14	-1,22761	0,712007	0,918	0,001
84	1,083	2	1,288288394	-4,03821	14	-1,2231	0,711712	0,917	0,001
85	1,084	2	1,288583761	-4,02602	14	-1,21858	0,711416	0,916	0,001
86	1,085	2	1,288878956	-4,01381	14	-1,21407	0,711121	0,915	0,001
87	1,086	2	1,289173978	-4,00159	14	-1,20955	0,710826	0,914	0,001
88	1,087	2	1,289468827	-3,98936	14	-1,20504	0,710531	0,913	0,001
89	1,088	2	1,289763503	-3,97711	14	-1,20053	0,710236	0,912	0,001
90	1,089	2	1,290058008	-3,96485	14	-1,19602	0,709942	0,911	0,001
91	1,09	2	1,29035234	-3,95257	14	-1,19151	0,709648	0,91	0,001
92	1,091	2	1,2906465	-3,94028	14	-1,18701	0,709353	0,909	0,001
93	1,092	2	1,290940488	-3,92797	14	-1,1825	0,70906	0,908	0,001

94	1,093	2	1,291234305	-3,91565	14	-1,178	0,708766	0,907	0,001
95	1,094	2	1,29152795	-3,90332	14	-1,1735	0,708472	0,906	0,001
96	1,095	2	1,291821423	-3,89097	14	-1,16899	0,708179	0,905	0,001
97	1,096	2	1,292114724	-3,8786	14	-1,16449	0,707885	0,904	0,001
98	1,097	2	1,292407855	-3,86622	14	-1,16	0,707592	0,903	0,001
99	1,098	2	1,292700814	-3,85383	14	-1,1555	0,707299	0,902	0,001
100	1,099	2	1,292993602	-3,84142	14	-1,151	0,707006	0,901	0,001
101	1,1	2	1,293286219	-3,829	14	-1,14651	0,706714	0,9	0,001
102	1,101	2	1,293578665	-3,81656	14	-1,14201	0,706421	0,899	0,001
103	1,102	2	1,293870941	-3,80411	14	-1,13752	0,706129	0,898	0,001
104	1,103	2	1,294163046	-3,79164	14	-1,13303	0,705837	0,897	0,001
105	1,104	2	1,294454981	-3,77916	14	-1,12854	0,705545	0,896	0,001
106	1,105	2	1,294746745	-3,76667	14	-1,12405	0,705253	0,895	0,001
107	1,106	2	1,295038339	-3,75416	14	-1,11956	0,704962	0,894	0,001
108	1,107	2	1,295329763	-3,74163	14	-1,11508	0,70467	0,893	0,001
109	1,108	2	1,295621017	-3,72909	14	-1,11059	0,704379	0,892	0,001
110	1,109	2	1,295912101	-3,71654	14	-1,10611	0,704088	0,891	0,001
111	1,11	2	1,296203015	-3,70397	14	-1,10163	0,703797	0,89	0,001
112	1,111	2	1,29649376	-3,69139	14	-1,09714	0,703506	0,889	0,001
113	1,112	2	1,296784335	-3,67879	14	-1,09266	0,703216	0,888	0,001
114	1,113	2	1,297074741	-3,66617	14	-1,08819	0,702925	0,887	0,001
115	1,114	2	1,297364978	-3,65355	14	-1,08371	0,702635	0,886	0,001
116	1,115	2	1,297655046	-3,6409	14	-1,07923	0,702345	0,885	0,001
117	1,116	2	1,297944944	-3,62825	14	-1,07476	0,702055	0,884	0,001
118	1,117	2	1,298234674	-3,61558	14	-1,07028	0,701765	0,883	0,001
119	1,118	2	1,298524235	-3,60289	14	-1,06581	0,701476	0,882	0,001
120	1,119	2	1,298813628	-3,59019	14	-1,06134	0,701186	0,881	0,001
121	1,12	2	1,299102852	-3,57747	14	-1,05687	0,700897	0,88	0,001
122	1,121	2	1,299391907	-3,56474	14	-1,0524	0,700608	0,879	0,001
123	1,122	2	1,299680795	-3,552	14	-1,04794	0,700319	0,878	0,001
124	1,123	2	1,299969514	-3,53924	14	-1,04347	0,70003	0,877	0,001
125	1,124	2	1,300258065	-3,52646	14	-1,03901	0,699742	0,876	0,001
126	1,125	2	1,300546448	-3,51367	14	-1,03454	0,699454	0,875	0,001
127	1,126	2	1,300834664	-3,50087	14	-1,03008	0,699165	0,874	0,001
128	1,127	2	1,301122711	-3,48805	14	-1,02562	0,698877	0,873	0,001
129	1,128	2	1,301410592	-3,47521	14	-1,02116	0,698589	0,872	0,001
130	1,129	2	1,301698305	-3,46237	14	-1,0167	0,698302	0,871	0,001
131	1,13	2	1,30198585	-3,4495	14	-1,01225	0,698014	0,87	0,001
132	1,131	2	1,302273229	-3,43662	14	-1,00779	0,697727	0,869	0,001
133	1,132	2	1,30256044	-3,42373	14	-1,00334	0,69744	0,868	0,001
134	1,133	2	1,302847485	-3,41082	14	-0,99889	0,697153	0,867	0,001
135	1,134	2	1,303134362	-3,3979	14	-0,99443	0,696866	0,866	0,001
136	1,135	2	1,303421073	-3,38496	14	-0,98998	0,696579	0,865	0,001
137	1,136	2	1,303707618	-3,37201	14	-0,98553	0,696292	0,864	0,001
138	1,137	2	1,303993996	-3,35905	14	-0,98109	0,696006	0,863	0,001
139	1,138	2	1,304280207	-3,34606	14	-0,97664	0,69572	0,862	0,001
140	1,139	2	1,304566253	-3,33307	14	-0,9722	0,695434	0,861	0,001

141	1,14	2	1,304852132	-3,32006	14	-0,96775	0,695148	0,86	0,001
142	1,141	2	1,305137846	-3,30703	14	-0,96331	0,694862	0,859	0,001
143	1,142	2	1,305423393	-3,29399	14	-0,95887	0,694577	0,858	0,001
144	1,143	2	1,305708775	-3,28093	14	-0,95443	0,694291	0,857	0,001
145	1,144	2	1,305993991	-3,26786	14	-0,94999	0,694006	0,856	0,001
146	1,145	2	1,306279042	-3,25478	14	-0,94555	0,693721	0,855	0,001
147	1,146	2	1,306563927	-3,24168	14	-0,94112	0,693436	0,854	0,001
148	1,147	2	1,306848647	-3,22856	14	-0,93668	0,693151	0,853	0,001
149	1,148	2	1,307133202	-3,21543	14	-0,93225	0,692867	0,852	0,001
150	1,149	2	1,307417592	-3,20229	14	-0,92781	0,692582	0,851	0,001
151	1,15	2	1,307701817	-3,18913	14	-0,92338	0,692298	0,85	0,001
152	1,151	2	1,307985878	-3,17595	14	-0,91895	0,692014	0,849	0,001
153	1,152	2	1,308269773	-3,16276	14	-0,91453	0,69173	0,848	0,001
154	1,153	2	1,308553504	-3,14956	14	-0,9101	0,691446	0,847	0,001
155	1,154	2	1,308837071	-3,13634	14	-0,90567	0,691163	0,846	0,001
156	1,155	2	1,309120473	-3,1231	14	-0,90125	0,69088	0,845	0,001
157	1,156	2	1,309403712	-3,10985	14	-0,89683	0,690596	0,844	0,001
158	1,157	2	1,309686786	-3,09659	14	-0,8924	0,690313	0,843	0,001
159	1,158	2	1,309969696	-3,08331	14	-0,88798	0,69003	0,842	0,001
160	1,159	2	1,310252442	-3,07001	14	-0,88356	0,689748	0,841	0,001
161	1,16	2	1,310535025	-3,0567	14	-0,87915	0,689465	0,84	0,001
162	1,161	2	1,310817444	-3,04338	14	-0,87473	0,689183	0,839	0,001
163	1,162	2	1,311099699	-3,03004	14	-0,87031	0,6889	0,838	0,001
164	1,163	2	1,311381792	-3,01669	14	-0,8659	0,688618	0,837	0,001
165	1,164	2	1,311663721	-3,00332	14	-0,86149	0,688336	0,836	0,001
166	1,165	2	1,311945486	-2,98993	14	-0,85707	0,688055	0,835	0,001
167	1,166	2	1,312227089	-2,97653	14	-0,85266	0,687773	0,834	0,001
168	1,167	2	1,312508529	-2,96312	14	-0,84826	0,687491	0,833	0,001
169	1,168	2	1,312789806	-2,94969	14	-0,84385	0,68721	0,832	0,001
170	1,169	2	1,313070921	-2,93625	14	-0,83944	0,686929	0,831	0,001
171	1,17	2	1,313351873	-2,92279	14	-0,83504	0,686648	0,83	0,001
172	1,171	2	1,313632662	-2,90931	14	-0,83063	0,686367	0,829	0,001
173	1,172	2	1,31391329	-2,89582	14	-0,82623	0,686087	0,828	0,001
174	1,173	2	1,314193755	-2,88232	14	-0,82183	0,685806	0,827	0,001
175	1,174	2	1,314474058	-2,8688	14	-0,81743	0,685526	0,826	0,001
176	1,175	2	1,314754199	-2,85527	14	-0,81303	0,685246	0,825	0,001
177	1,176	2	1,315034178	-2,84172	14	-0,80863	0,684966	0,824	0,001
178	1,177	2	1,315313995	-2,82815	14	-0,80424	0,684686	0,823	0,001
179	1,178	2	1,315593651	-2,81457	14	-0,79984	0,684406	0,822	0,001
180	1,179	2	1,315873145	-2,80098	14	-0,79545	0,684127	0,821	0,001
181	1,18	2	1,316152478	-2,78737	14	-0,79106	0,683848	0,82	0,001
182	1,181	2	1,31643165	-2,77374	14	-0,78666	0,683568	0,819	0,001
183	1,182	2	1,316710661	-2,7601	14	-0,78228	0,683289	0,818	0,001
184	1,183	2	1,31698951	-2,74645	14	-0,77789	0,68301	0,817	0,001
185	1,184	2	1,317268199	-2,73278	14	-0,7735	0,682732	0,816	0,001
186	1,185	2	1,317546727	-2,71909	14	-0,76911	0,682453	0,815	0,001
187	1,186	2	1,317825094	-2,70539	14	-0,76473	0,682175	0,814	0,001
188	1,187	2	1,3181033	-2,69168	14	-0,76035	0,681897	0,813	0,001
189	1,188	2	1,318381347	-2,67795	14	-0,75597	0,681619	0,812	0,001

190	1,189	2	1,318659232	-2,6642	14	-0,75158	0,681341	0,811	0,001
191	1,19	2	1,318936958	-2,65044	14	-0,74721	0,681063	0,81	0,001
192	1,191	2	1,319214523	-2,63667	14	-0,74283	0,680785	0,809	0,001
193	1,192	2	1,319491929	-2,62287	14	-0,73845	0,680508	0,808	0,001
194	1,193	2	1,319769174	-2,60907	14	-0,73408	0,680231	0,807	0,001
195	1,194	2	1,32004626	-2,59525	14	-0,7297	0,679954	0,806	0,001
196	1,195	2	1,320323186	-2,58141	14	-0,72533	0,679677	0,805	0,001
197	1,196	2	1,320599953	-2,56756	14	-0,72096	0,6794	0,804	0,001
198	1,197	2	1,32087656	-2,55369	14	-0,71659	0,679123	0,803	0,001
199	1,198	2	1,321153008	-2,53981	14	-0,71222	0,678847	0,802	0,001
200	1,199	2	1,321429297	-2,52591	14	-0,70785	0,678571	0,801	0,001
201	1,2	2	1,321705426	-2,512	14	-0,70348	0,678295	0,8	0,001
202	1,201	2	1,321981397	-2,49807	14	-0,69912	0,678019	0,799	0,001
203	1,202	2	1,322257209	-2,48413	14	-0,69476	0,677743	0,798	0,001
204	1,203	2	1,322532862	-2,47017	14	-0,69039	0,677467	0,797	0,001
205	1,204	2	1,322808356	-2,4562	14	-0,68603	0,677192	0,796	0,001
206	1,205	2	1,323083692	-2,44221	14	-0,68167	0,676916	0,795	0,001
207	1,206	2	1,32335887	-2,42821	14	-0,67732	0,676641	0,794	0,001
208	1,207	2	1,323633889	-2,41419	14	-0,67296	0,676366	0,793	0,001
209	1,208	2	1,32390875	-2,40015	14	-0,6686	0,676091	0,792	0,001
210	1,209	2	1,324183453	-2,3861	14	-0,66425	0,675817	0,791	0,001
211	1,21	2	1,324457998	-2,37204	14	-0,65989	0,675542	0,79	0,001
212	1,211	2	1,324732385	-2,35796	14	-0,65554	0,675268	0,789	0,001
213	1,212	2	1,325006615	-2,34386	14	-0,65119	0,674993	0,788	0,001
214	1,213	2	1,325280687	-2,32975	14	-0,64684	0,674719	0,787	0,001
215	1,214	2	1,325554601	-2,31563	14	-0,64249	0,674445	0,786	0,001
216	1,215	2	1,325828358	-2,30149	14	-0,63815	0,674172	0,785	0,001
217	1,216	2	1,326101958	-2,28733	14	-0,6338	0,673898	0,784	0,001
218	1,217	2	1,326375401	-2,27316	14	-0,62946	0,673625	0,783	0,001
219	1,218	2	1,326648686	-2,25897	14	-0,62512	0,673351	0,782	0,001
220	1,219	2	1,326921815	-2,24477	14	-0,62077	0,673078	0,781	0,001
221	1,22	2	1,327194787	-2,23055	14	-0,61643	0,672805	0,78	0,001
222	1,221	2	1,327467602	-2,21632	14	-0,6121	0,672532	0,779	0,001
223	1,222	2	1,32774026	-2,20207	14	-0,60776	0,67226	0,778	0,001
224	1,223	2	1,328012762	-2,18781	14	-0,60342	0,671987	0,777	0,001
225	1,224	2	1,328285108	-2,17353	14	-0,59909	0,671715	0,776	0,001
226	1,225	2	1,328557297	-2,15923	14	-0,59475	0,671443	0,775	0,001
227	1,226	2	1,328829331	-2,14492	14	-0,59042	0,671171	0,774	0,001
228	1,227	2	1,329101208	-2,1306	14	-0,58609	0,670899	0,773	0,001
229	1,228	2	1,329372929	-2,11626	14	-0,58176	0,670627	0,772	0,001
230	1,229	2	1,329644495	-2,1019	14	-0,57743	0,670356	0,771	0,001
231	1,23	2	1,329915904	-2,08753	14	-0,5731	0,670084	0,77	0,001
232	1,231	2	1,330187159	-2,07315	14	-0,56878	0,669813	0,769	0,001
233	1,232	2	1,330458257	-2,05874	14	-0,56445	0,669542	0,768	0,001
234	1,233	2	1,330729201	-2,04433	14	-0,56013	0,669271	0,767	0,001
235	1,234	2	1,330999989	-2,0299	14	-0,55581	0,669	0,766	0,001
236	1,235	2	1,331270622	-2,01545	14	-0,55149	0,668729	0,765	0,001

237	1,236	2	1,3315411	-2,00098	14	-0,54717	0,668459	0,764	0,001
238	1,237	2	1,331811422	-1,9865	14	-0,54285	0,668189	0,763	0,001
239	1,238	2	1,332081591	-1,97201	14	-0,53853	0,667918	0,762	0,001
240	1,239	2	1,332351604	-1,9575	14	-0,53422	0,667648	0,761	0,001
241	1,24	2	1,332621463	-1,94298	14	-0,5299	0,667379	0,76	0,001
242	1,241	2	1,332891167	-1,92844	14	-0,52559	0,667109	0,759	0,001
243	1,242	2	1,333160717	-1,91388	14	-0,52128	0,666839	0,758	0,001
244	1,243	2	1,333430113	-1,89931	14	-0,51697	0,66657	0,757	0,001
245	1,244	2	1,333699354	-1,88472	14	-0,51266	0,666301	0,756	0,001
246	1,245	2	1,333968442	-1,87012	14	-0,50835	0,666032	0,755	0,001
247	1,246	2	1,334237376	-1,8555	14	-0,50405	0,665763	0,754	0,001
248	1,247	2	1,334506155	-1,84087	14	-0,49974	0,665494	0,753	0,001
249	1,248	2	1,334774781	-1,82622	14	-0,49544	0,665225	0,752	0,001
250	1,249	2	1,335043254	-1,81155	14	-0,49114	0,664957	0,751	0,001
251	1,25	2	1,335311573	-1,79688	14	-0,48684	0,664688	0,75	0,001
252	1,251	2	1,335579738	-1,78218	14	-0,48254	0,66442	0,749	0,001
253	1,252	2	1,33584775	-1,76747	14	-0,47824	0,664152	0,748	0,001
254	1,253	2	1,33611561	-1,75274	14	-0,47394	0,663884	0,747	0,001
255	1,254	2	1,336383316	-1,738	14	-0,46964	0,663617	0,746	0,001
256	1,255	2	1,336650869	-1,72324	14	-0,46535	0,663349	0,745	0,001
257	1,256	2	1,336918269	-1,70847	14	-0,46106	0,663082	0,744	0,001
258	1,257	2	1,337185516	-1,69368	14	-0,45676	0,662814	0,743	0,001
259	1,258	2	1,337452611	-1,67888	14	-0,45247	0,662547	0,742	0,001
260	1,259	2	1,337719554	-1,66406	14	-0,44818	0,66228	0,741	0,001
261	1,26	2	1,337986344	-1,64922	14	-0,4439	0,662014	0,74	0,001
262	1,261	2	1,338252981	-1,63437	14	-0,43961	0,661747	0,739	0,001
263	1,262	2	1,338519467	-1,61951	14	-0,43533	0,661481	0,738	0,001
264	1,263	2	1,3387858	-1,60463	14	-0,43104	0,661214	0,737	0,001
265	1,264	2	1,339051981	-1,58973	14	-0,42676	0,660948	0,736	0,001
266	1,265	2	1,339318011	-1,57482	14	-0,42248	0,660682	0,735	0,001
267	1,266	2	1,339583889	-1,55989	14	-0,4182	0,660416	0,734	0,001
268	1,267	2	1,339849615	-1,54494	14	-0,41392	0,66015	0,733	0,001
269	1,268	2	1,340115189	-1,52998	14	-0,40964	0,659885	0,732	0,001
270	1,269	2	1,340380613	-1,51501	14	-0,40536	0,659619	0,731	0,001
271	1,27	2	1,340645884	-1,50002	14	-0,40109	0,659354	0,73	0,001
272	1,271	2	1,340911005	-1,48501	14	-0,39682	0,659089	0,729	0,001
273	1,272	2	1,341175975	-1,46999	14	-0,39254	0,658824	0,728	0,001
274	1,273	2	1,341440793	-1,45495	14	-0,38827	0,658559	0,727	0,001
275	1,274	2	1,341705461	-1,4399	14	-0,384	0,658295	0,726	0,001
276	1,275	2	1,341969977	-1,42483	14	-0,37973	0,65803	0,725	0,001
277	1,276	2	1,342234343	-1,40974	14	-0,37547	0,657766	0,724	0,001
278	1,277	2	1,342498559	-1,39464	14	-0,3712	0,657501	0,723	0,001
279	1,278	2	1,342762624	-1,37953	14	-0,36694	0,657237	0,722	0,001
280	1,279	2	1,343026539	-1,3644	14	-0,36267	0,656973	0,721	0,001
281	1,28	2	1,343290303	-1,34925	14	-0,35841	0,65671	0,72	0,001
288	1,281	2	1,343553918	-1,33408	14	-0,35415	0,656446	0,719	0,001
289	1,282	2	1,343817382	-1,31891	14	-0,34989	0,656183	0,718	0,001
290	1,283	2	1,344080696	-1,30371	14	-0,34564	0,655919	0,717	0,001
291	1,284	2	1,344343861	-1,2885	14	-0,34138	0,655656	0,716	0,001

292	1,285	2	1,344606875	-1,27328	14	-0,33712	0,655393	0,715	0,001
293	1,286	2	1,34486974	-1,25803	14	-0,33287	0,65513	0,714	0,001
294	1,287	2	1,345132456	-1,24278	14	-0,32862	0,654868	0,713	0,001
295	1,288	2	1,345395022	-1,2275	14	-0,32437	0,654605	0,712	0,001
296	1,289	2	1,345657439	-1,21222	14	-0,32012	0,654343	0,711	0,001
297	1,29	2	1,345919707	-1,19691	14	-0,31587	0,65408	0,71	0,001
298	1,291	2	1,346181826	-1,18159	14	-0,31162	0,653818	0,709	0,001
299	1,292	2	1,346443795	-1,16625	14	-0,30737	0,653556	0,708	0,001
300	1,293	2	1,346705616	-1,1509	14	-0,30313	0,653294	0,707	0,001
301	1,294	2	1,346967288	-1,13554	14	-0,29889	0,653033	0,706	0,001
302	1,295	2	1,347228811	-1,12015	14	-0,29464	0,652771	0,705	0,001
303	1,296	2	1,347490186	-1,10475	14	-0,2904	0,65251	0,704	0,001
304	1,297	2	1,347751413	-1,08934	14	-0,28616	0,652249	0,703	0,001
305	1,298	2	1,348012491	-1,07391	14	-0,28193	0,651988	0,702	0,001
306	1,299	2	1,34827342	-1,05846	14	-0,27769	0,651727	0,701	0,001
307	1,3	2	1,348534202	-1,043	14	-0,27345	0,651466	0,7	0,001
308	1,301	2	1,348794836	-1,02752	14	-0,26922	0,651205	0,699	0,001
309	1,303	2	1,349315659	-0,99652	14	-0,26075	0,650684	0,697	0,002
310	1,304	2	1,349575849	-0,98099	14	-0,25652	0,650424	0,696	0,001
311	1,305	2	1,349835892	-0,96545	14	-0,25229	0,650164	0,695	0,001
312	1,306	2	1,350095787	-0,9499	14	-0,24807	0,649904	0,694	0,001
313	1,307	2	1,441701415	-0,93432	-10	1,310593	-1,4417	-1,307	0,001
314	1,308	2	1,350615134	-0,91873	14	-0,23962	0,649385	0,692	0,001
315	1,309	2	1,350874588	-0,90313	14	-0,23539	0,649125	0,691	0,001
316	1,31	2	1,351133894	-0,88751	14	-0,23117	0,648866	0,69	0,001
317	1,311	2	1,351393053	-0,87187	14	-0,22695	0,648607	0,689	0,001
318	1,312	2	1,351652065	-0,85622	14	-0,22273	0,648348	0,688	0,001
319	1,313	2	1,35191093	-0,84055	14	-0,21851	0,648089	0,687	0,001
320	1,314	2	1,352169649	-0,82487	14	-0,21429	0,64783	0,686	0,001
321	1,315	2	1,352428221	-0,80917	14	-0,21008	0,647572	0,685	0,001
322	1,316	2	1,352686646	-0,79345	14	-0,20586	0,647313	0,684	0,001
323	1,317	2	1,352944926	-0,77772	14	-0,20165	0,647055	0,683	0,001
324	1,318	2	1,353203059	-0,76197	14	-0,19744	0,646797	0,682	0,001
325	1,319	2	1,353461045	-0,74621	14	-0,19323	0,646539	0,681	0,001
326	1,32	2	1,353718886	-0,73043	14	-0,18902	0,646281	0,68	0,001
327	1,321	2	1,353976581	-0,71464	14	-0,18481	0,646023	0,679	0,001
328	1,322	2	1,35423413	-0,69883	14	-0,1806	0,645766	0,678	0,001
329	1,323	2	1,354491533	-0,683	14	-0,1764	0,645508	0,677	0,001
330	1,324	2	1,354748791	-0,66716	14	-0,17219	0,645251	0,676	0,001
331	1,325	2	1,355005903	-0,6513	14	-0,16799	0,644994	0,675	0,001
332	1,326	2	1,355262869	-0,63542	14	-0,16379	0,644737	0,674	0,001
333	1,327	2	1,355519691	-0,61953	14	-0,15959	0,64448	0,673	0,001
334	1,328	2	1,355776367	-0,60362	14	-0,15539	0,644224	0,672	0,001
335	1,329	2	1,356032898	-0,5877	14	-0,15119	0,643967	0,671	0,001
336	1,33	2	1,356289284	-0,57176	14	-0,147	0,643711	0,67	0,001
337	1,331	2	1,356545525	-0,55581	14	-0,1428	0,643454	0,669	0,001
338	1,332	2	1,356801621	-0,53984	14	-0,13861	0,643198	0,668	0,001

339	1,333	2	1,357057572	-0,52385	14	-0,13441	0,642942	0,667	0,001
340	1,334	2	1,357313379	-0,50785	14	-0,13022	0,642687	0,666	0,001
341	1,335	2	1,357569041	-0,49183	14	-0,12603	0,642431	0,665	0,001
342	1,336	2	1,357824559	-0,47579	14	-0,12185	0,642175	0,664	0,001
343	1,337	2	1,358079933	-0,45974	14	-0,11766	0,64192	0,663	0,001
344	1,338	2	1,358335162	-0,44368	14	-0,11347	0,641665	0,662	0,001
345	1,339	2	1,358590247	-0,42759	14	-0,10929	0,64141	0,661	0,001
346	1,34	2	1,358845189	-0,4115	14	-0,10511	0,641155	0,66	0,001
347	1,341	2	1,359099986	-0,39538	14	-0,10092	0,6409	0,659	0,001
348	1,342	2	1,359354639	-0,37925	14	-0,09674	0,640645	0,658	0,001
349	1,343	2	1,359609149	-0,3631	14	-0,09256	0,640391	0,657	0,001
350	1,344	2	1,359863516	-0,34694	14	-0,08839	0,640136	0,656	0,001
351	1,345	2	1,360117738	-0,33076	14	-0,08421	0,639882	0,655	0,001
352	1,346	2	1,360371818	-0,31457	14	-0,08003	0,639628	0,654	0,001
353	1,347	2	1,360625754	-0,29836	14	-0,07586	0,639374	0,653	0,001
354	1,348	2	1,360879547	-0,28213	14	-0,07169	0,63912	0,652	0,001
355	1,349	2	1,361133196	-0,26588	14	-0,06752	0,638867	0,651	0,001
356	1,35	2	1,361386703	-0,24962	14	-0,06335	0,638613	0,65	0,001
357	1,351	2	1,361640067	-0,23335	14	-0,05918	0,63836	0,649	0,001
358	1,352	2	1,361893288	-0,21706	14	-0,05501	0,638107	0,648	0,001
359	1,353	2	1,362146367	-0,20075	14	-0,05084	0,637854	0,647	0,001
360	1,354	2	1,362399302	-0,18443	14	-0,04668	0,637601	0,646	0,001
361	1,355	2	1,362652096	-0,16809	14	-0,04252	0,637348	0,645	0,001
362	1,356	2	1,362904747	-0,15173	14	-0,03835	0,637095	0,644	0,001
363	1,357	2	1,363157255	-0,13536	14	-0,03419	0,636843	0,643	0,001
364	1,358	2	1,363409622	-0,11897	14	-0,03003	0,63659	0,642	0,001
365	1,359	2	1,363661846	-0,10256	14	-0,02588	0,636338	0,641	0,001
366	1,36	2	1,363913928	-0,08614	14	-0,02172	0,636086	0,64	0,001
361	1,361	2	1,364165869	-0,06971	14	-0,01756	0,635834	0,639	0,001
362	1,362	2	1,364417668	-0,05325	14	-0,01341	0,635582	0,638	0,001
363	1,363	2	1,364669325	-0,03678	14	-0,00926	0,635331	0,637	0,001
364	1,364	2	1,36492084	-0,0203	14	-0,0051	0,635079	0,636	0,001
365	1,365	2	1,365172214	-0,0038	14	-0,00095	0,634828	0,635	0,001
366	1,366	2	1,365423447	0,01272	14	0,003195	0,634577	0,634	0,001

Based on the steps or sequence of calculations for the polynomial roots of $x^3 + 4x^2 - 10 = 0$ in table 2 using the false position method (false rule) to obtain the roots of solving polynomial equations. The author states that from the first step to the 366th step it turns out that f(c)=0.003195 at the time c=1,365423447. Thus the polynomial roots of $x^3 + 4x^2 - 10 = 0$ using the false position method (regulation false) are 1.365423447. The author finds that if the calculation is continued, then in the 367th and subsequent steps f(c) is further away from zero as shown in table 2 above. The author concludes that if the 366th step is continued, then f(c) will not approach zero or in other words the value of f(c) is further away from zero (0) and it can be seen that there are looping process approaches resulting from f(c).

V. CONCLUSIONS

From this research study, it is concluded that the roots of the polynomial of $x^3 + 4x^2 - 10 = 0$, using the bisection method are 1.36474675. Meanwhile, using the false position method (regulation false) is 1.365423447

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